

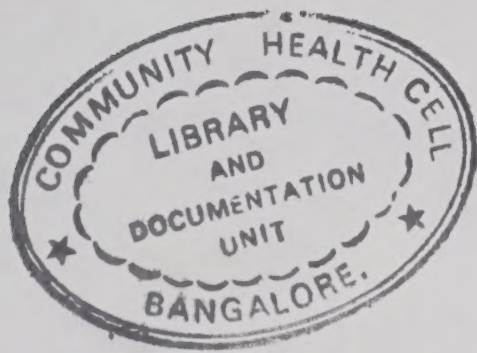
# ***Training for Building Self-reliant Communities through Shelter Development Initiatives***



*Centre for Habitat Technology Research, Development and Action  
Bangalore 560 095 [India]*

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02814





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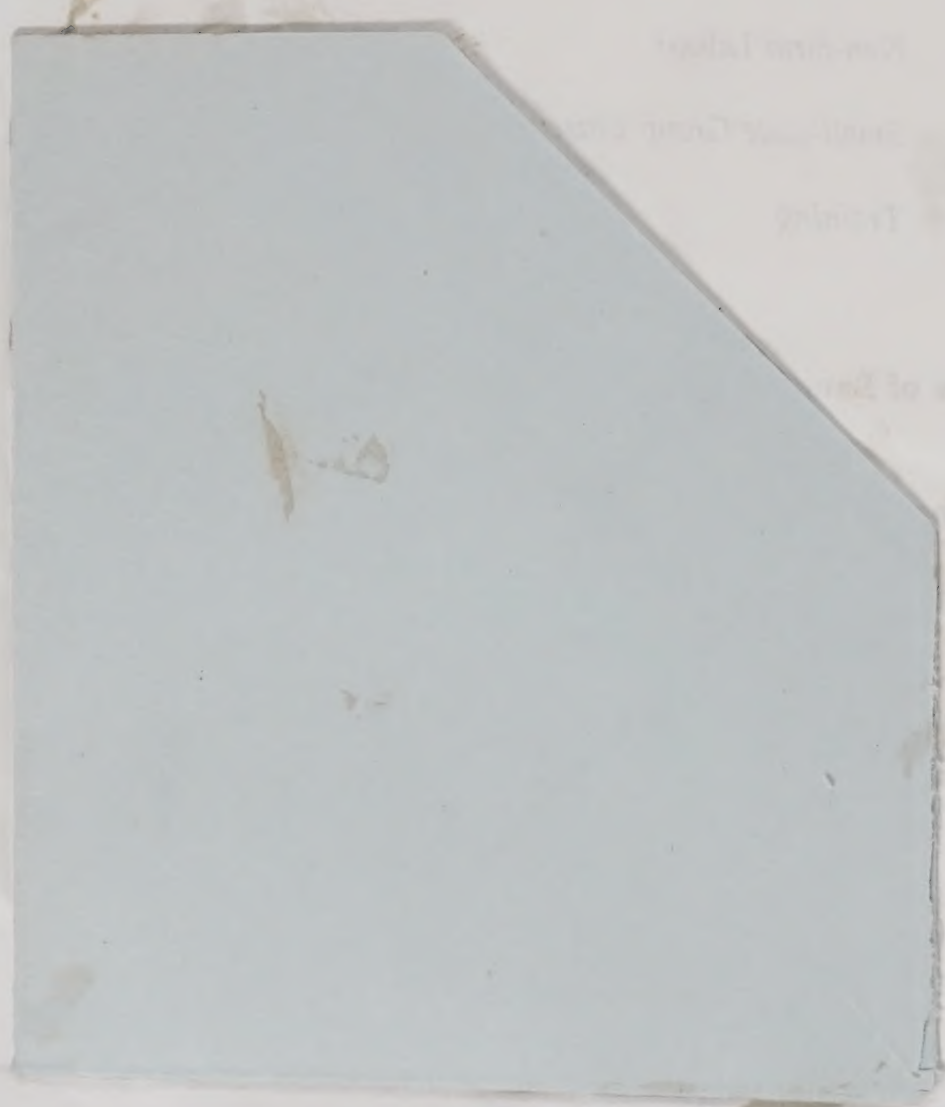
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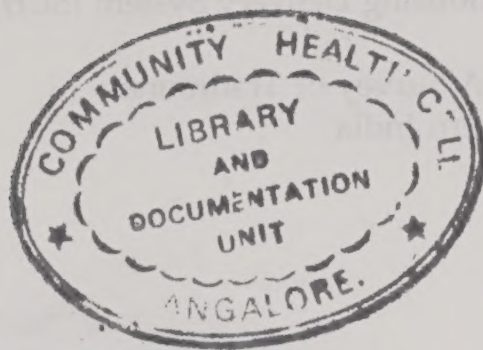
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## Summary

- a. Objectives**
- To challenge the socio-political-economic issues of the region by specifically addressing shelter problems through transfer of appropriate technology, and the development of building and construction competence and skills, viz.,
- o Establishment of Self-contained Housing Delivery System (SCHDS) skill training centres for the promotion of micro-level building material production units in collaborations with social action groups.*
  - o Experiment various technologies in building material production and self-help housing.*
  - o Pursue participatory research and action to support shelter development process among the poor whilst challenging larger socio-economic issues.*
- b. Duration**
- Four years (1993 to 1997)
- c. Target Area**
- Principal Centre* would be located at Bangalore. Training activities will be pursued in collaboration with Social Action Groups [SAGs] at Bangalore, Kolar [Karnataka] and Madurai [Tamil Nadu]; later, subregional training units will be established at these places.
- d. Target Group**
- Youth and women from poor households in rural and urban areas to be trained as *producers* of building materials and *builders*. Initially, thirty participants from Bangalore, Madurai and Kolar would be trained in SCHDS and function as the "Core" trainers, who will be the key functionaries in their respective areas for training others and formation of "self-help, community-based" shelter initiatives and cooperatives.
- e. Proposed Activities**
- 1993 - *Preparatory work*
- 1994 - *Launching of SCHDS and Training of Trainers*
- o Training and experimental production and building of units using materials made;*
  - o Simultaneously, fabrication of SCHDS units in India based on local research and development;*
  - o Motivating other SAGs to participate.*
  - o Formation of Self-help initiatives; establish People's Co-operatives/micro-enterprises; production of building materials and supply to market;*
  - o Pursue shelter research studies.*











This *participatory-social action proposal* is the outcome of our continuous interactions through discussions, field experiments and research over a period that we pursued in collaboration with several concerned *Social Action Groups [SAGs]* (also known as *Non-Governmental Organisations - NGOs*), *Non-Governmental Individuals [NGIs]*, housing professionals and representatives of various *Government agencies*, who respond to numerous developmental issues that affect the poor. We realised that one of the basic needs i.e., *shelter and shelter-related issues of the poor* [that included land reforms and land availability for building residential units] have received thoughtful attention by the professionals, policy-makers, *SAGs* and *NGIs*; however, the rapidly growing housing needs of the poor could not be met by the various state agencies or *SAGs* alone as their efforts and programmes are continued to be characterised : (i) by organisational deficiencies and insufficient alternatives; (ii) lack of suitable information and training systems, and (iii) inadequate supplementary endeavours by *SAGs*. This situation is most likely to intensify if due attention is not given by the *SAGs* to thoroughly understand the major forces that direct the contemporary *shelter development process*, and promote suitable supplementary strategies to *empower the poor by facilitating access to shelter*. To challenge these principal shelter issues, *SAGs* need access to various inputs and support to form "*self-reliant and self-help building communities*". An important input for the *SAGs*, its cadre and *NGIs* to ceaselessly understand the shelter (and developmental) issues, gain insights, and propose alternatives is through various forms of "*training and practice*".

*Centre for Habitat Technology Research, Development and Action (CHTRDA)*, is a broad coalition of trained professionals and social activists having similar aspirations to support the formation of an egalitarian and just society. *CHTRDA* came into being as an informal team during 1992 and was later established as a legal entity to promote socio-economic progress through "*shelter development*". To formulate this vision, *we*, its members, began a careful review of the status of "*shelter development*" efforts by the government and private agencies; and reflected on our individual experiences. It was obvious that the state-sponsored "*shelter development*" initiative had largely failed to meet the growing housing needs of the poor. There is a need to establish an unique, dynamic pattern of socio-economic reconstruction through *shelter development*. This contemplated model, with adaptation and improvements, should be easily duplicated in any developing area as a local programme. *Shelter Development Training and Participatory Urban and Housing Research Team* of this Centre will be based at Bangalore (a rapidly growing metropolitan city in South India). Its trainers will travel to various training units located elsewhere. The principal centre at Bangalore will start functioning by early 1994. The "*training of trainers*" will begin by mid-1994; subregional training centres would be established at Madurai and Kolar [mid-1994] in collaboration with local *SAGs*, who have evinced keen interest in this initiative and are part of this preparatory process.

## **A      Situating Our Participatory Shelter Action Programme**

Between 1988 and 1992 we interacted with many *Social Action Groups* in South India, pursued a number of research studies - independently and in collaboration with *SAGs* and students - to examine the characteristics of urbanisation and shelter issues. A constant praxis of *action - reflection* was maintained by pursuing many research and development activities related to "*shelter*" issues. The pursuits were : (a) Life and Working Conditions of Construction Labourers; (b) Potentials of Construction Sector as a Self-employment Sector; (c) Mud Housing Semi-arid Tropical Regions - A Case Study of Anantapur in Andhra Pradesh; and (d) People's Architecture. A few more research studies are continuing. Simultaneously, we also examined the construction market by analysing the supply of materials such as bricks, stone, mud etc. We scrutinised availability of resources, building patterns, climatic conditions and skill levels; as an experiment, we also enabled construction of a few community centres using different materials, and developed our own strategies in building materials production, construction etc (**Refer Enclosure A**).





For accomplishing these research and development tasks, we participated in a number of subregional and local level meetings on shelter issues. Apparently, the current fabric of building construction techniques followed in the urban and semi-urban areas are not affordable by the masses. Modern construction methods consume high energy, expensive to adopt and require special skill to handle the materials; therefore, these materials are not appropriate for mass housing often built in self-help mode. Traditionally, building construction in rural areas is based on the use of indigenous materials and methods. Wood and cut stone are used as major structural elements. Due to rapid depletion of forest resources, wood/stone has become a scarce and expensive building material. Therefore, poor households could not afford to buy building materials produced through conventional or modern methods, and they continue to live in deplorable conditions. In summary, it was observed that :

- \* The acute shortage of housing and pressure on services continue to swell and this trend is likely to persist *i.e., growing housing deficits and deterioration of the physical environment*; also, land reforms have been sluggish and land available for residential purposes is declining;
- \* Depletion of natural building materials such as wood or bamboo, and conventional use of energy intensive building materials and methods for housing leave no choice for the poor to fulfil their shelter needs;
- \* This trend has resulted in the scarcity of building materials and their price escalations *i.e., rising production costs*;
- \* The housing sector is commercialised by private agencies, and the poor cannot afford to either rent or own a dwelling unit; also, public and quasi-public sectors have failed to produce adequate number of residential units. This has denied poor an access to adequate, appropriate and affordable housing and services.
- \* The organisational support available to motivate self-help housing programmes based on a cooperative approach are negligible; even when followed, these schemes did not contain an educational component necessary for learning by the target beneficiaries.

If this trend is allowed to continue, then the number of shelterless population will rapidly increase, thwarting any meaningful progress in the socio-economic sectors. Therefore, a large number of SAGs acknowledge the need to increase the momentum in *shelter development activity* to enhance the confidence and awareness of the people; SAGs believe that such a process will enable the poor to gain access to adequate and affordable shelter, and income earning opportunities towards self-reliance.

Therefore, developing suitable strategies to enable the poor acquire appropriate shelter is a major challenge. In principle, any such explicit strategy should also meet two essential criteria : *first*, they must be able to meet the needs of gainful employment for the poor; *second*, the process must ensure that it enables them to build durable assets and empower the participants for inducing larger social endeavours. This understanding suggests the need for a new "*shelter development*" approach that would generate a self-reinforcing process aiming :

- \* To facilitate access of the poor to various housing needs;
- \* To challenge the key socio-economic developmental problems through a concerted process of *shelter development*;





- \* To organise this effort more oriented towards the empowerment of the poorest sections of the community by initiating more job opportunities, house ownership; and thereby minimise, and hopefully eliminate social and economic inequalities in the society; and
- \* To promote popular participation in any *shelter development* initiative;

### Professional Progress

During our earlier professional participation in shelter planning and implementation projects, we observed the "*formal and informal building materials production*" systems in the region. We identified that the small-scale building materials production industry (especially artisanal trades) has been weak, and it has no institutional and state support. This has resulted in the scarcity of building materials at affordable prices and shortage of dwelling units. We believe that a modest fillip to this artisanal sector would enable the poor : (i) to gain access to income and foster self-help housing; and (ii) reduce out-migration to cities from the rural areas.

Concurrently, we were actively learning and experimenting at the *Habitech Park* developed by the *Division of Human Settlements, Asian Institute of Technology* (Bangkok, Thailand). This is a research, development and promotion centre focusing on housing-construction technology. *Self-Contained Housing Delivery System (SCHDS)* designed by it comprises of a series of modular inter-locking building components (**Refer Enclosure B**) when assembled together make permanent, fire and water/moisture resistant housing units with a life expectancy of not less than 50 years without much maintenance. Each component of this system is designed and experimented, and later offered as a training-cum-self-reliance programme. This construction technique is less energy-intensive and does not require special skill for assembly, and is appropriate for promoting self-help community housing projects. *SCHDS*, in its various adapted forms, is popular in Southeast Asia and Indo-China, and is widely used among the government and non-governmental agencies [e.g., ILO] as a tool for shelter provision and income generating activity that leads to socio-economic advancement of the community.

With our varied individual experiences and background, we have modified the design and working mechanisms of *SCHDS*, and developed/adapted it to suit socio-economic and climatic conditions in South India. We recognise the need to experiment *SCHDS* model and disseminate it as a tool for socio-economic self-reliance and self-help housing; simultaneously pursue few research and development works on "housing" issues. Thus, *CHTRDA* is not aiming to merely promote *SCHDS* but encourage and animate the emergence of a people's movement developed on shelter issues. For this purpose, we have elicited the support of local *SAGs*, *NGIs*, housing professionals and government agencies. Such a process of experimentation and dissemination is expected to highlight the available opportunities in achieving access to housing and community facilities; we maintain constant review of our efforts, and upgrade affordable housing technology and production tools that could serve as an agent for socio-economic empowerment. During our discussions with the local housing professionals we have solicited their support for the building materials to be produced by the trainees/participants of our proposed programme.

It is with this realisation and understanding that *Centre for Habitat Technology Research, Development and Action (CHTRDA)*, a broad coalition of social activists and concerned professionals, is initiated. *CHTRDA* will aim to inspire skill and entrepreneurship development among the poor and marginalised as a process of "empowerment", and allow them to gain self-confidence and work towards community self-reliance. This training (i.e., training in production of building materials, self-help community initiatives and group entrepreneurship) among *SAGs* is expected to provide opportunities to raise, probe





and understand several socio-economic-political issues; and it would also enable the poor achieve "economic rights" for the individual and the community. Therefore, the principal focus of this effort would be on shelter issues through training, self-help building efforts, and formation of self-help co-operatives. It is believed that the poor households have three basic characteristics that are necessary for such an experiment towards building group entrepreneurship viz., :-

- o Self-employment, being on one's own, not dependent on others' decisions;
- o Innovation in producing a new product, service, or in the manner in which it is produced, or marketed. This is observable among artisans, and it need not necessarily be creative, but can be through imitation of what is done elsewhere and improving it; and
- o Risk-taking and sharing amongst the members of the group.

Based on this view, it is proposed to initiate an effort that include activities such as : (a) awareness building; (b) group/community activity; (c) skills training; (d) formation of credit/savings' society at village level; and (e) group entrepreneurial endeavours. Some groups of rural producers are already engaged in such group or individual entrepreneurship, and their efforts could be supported.

## **B Objectives and Scope**

CHTRDA has proposed to collaboratively work with a number of *participating SAGs*<sup>1</sup>. These SAGs currently pursue several action programmes to bring in the appropriate developmental climate among the poor in their respective project areas. Their activities concentrate on integrated community development towards total emancipation of people through conscientisation and training (i.e., leadership and personal development), community formation, workers and peasant unions, co-operatives, women, cultural training, non-formal and adult education, literacy, human rights and environment. The broad objectives of CHTRDA initiatives are :

- o To enable poor and marginalised people gain knowledge and skills required for enhancing their socio-economic status by facilitating them to learn building materials production and construction techniques (*training component*)
- o To specifically train youth (girls and boys) in leadership and entrepreneurship qualities through non-formal education and skill training, and motivate them to form local level self-help cooperatives for sustainable socio-economic progress and action (*production of building materials and gaining self-reliance*)

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<sup>1</sup> The participating SAGs and broader coalition of the poor are : In Bangalore : Karnataka State Construction Workers Central Union; Karnataka Kolageri Nivasigala Samyukta Sanghane (Karnataka Slumdwellers Federation); In Kolar : Manush; In Madurai (Tamil Nadu) : MASS Trust. A few other SAGs have also shown interest to participate and they will be included after completing the training sessions at these three centres.





The specific objectives of this initiative are :

- I. **To address the shelter issues in the region through various appropriate initiatives.**
  - o *Establishment of Self-contained Housing Delivery System (SCHDS) skill training centres for the promotion of micro-level building material production units in collaboration with SAGs.*
  - o *Experiment various technologies in building material production and self-help housing.*
- II. **To pursue participatory research and action to support shelter development process among the poor whilst challenging broader socio-economic issues. This component aims to :**
  - o *To facilitate adequate production of building materials at affordable prices within the community and neighbourhood;*
  - o *To animate and support the trainees build community centers for interaction and enable it to emerge as a self-help building co-operative initiative*
  - o *To encourage the formation of self-help building communities*

## **C Concepts and Perceptions**

### **I. Development**

*Development* is a process by which one's overall personality is enhanced. This is relevant for the society as well as an individual. For society the identity is collective. Thus, development for society means development of the collective personality of the society. This requires physical (material and economic) development, and above all the progress and application of human consciousness and faculties. Therefore, in a comprehensive *community development and empowerment* process "economic" and "non-economic" elements interact organically with each other. Within the framework of this philosophy, development has to have its operational objectives. One, is the growth of the collective spirit mentioned above. Two, is to stimulate the spirit of cooperation, by means of which the collective consciousness may be prompted and the quantity of social good to be produced may be raised. Thus, creativity, innovativeness and a problem-solving approach to life are essential attributes for development and have to be cultivated among the participants. Improvement of knowledge is a basic requirement. A will to develop and faith in the collective creative potential of the human being are fundamental pre-requisites with which society must be equipped.

Against this background *self-reliance* refers to building up a combination of material and mental reserves that enable one to choose one's own course of evolution, uninhibited by what others desire. It requires maximum mobilisation of domestic resources for poor societies; it is based on the psychological and institutional staying power of the poor to meet crisis situations when there is a shortage of essential materials. This staying power is best attained collectively.

*Self-reliance* does not mean self-sufficiency. With psychological staying power a self-reliant society can open up and negotiate from a position of strength. But some measure of self-sufficiency is desirable. The vulnerable areas are : access to food, basic needs and income earning opportunities. All these make the development of appropriate and fitting technology indispensable. While development of modern sector





is imperative, the technological revolution has to be achieved internally. It may have been genuinely hoped that a developing area would not have to start from scratch, that they could borrow from the technology shelf of the west and adopt it to eastern needs with modifications. But history has shown that import substitution of technology is virtually impossible; unequal exchange of international trade, restrictive clauses of transfer and the inappropriateness of highly capital-intensive western technology militate against the possibility of developing nations achieving technological independence via outward looking strategy. Therefore, technological revolution has to be internally achieved also because of its social implications. The masses of people must not be alienated by a transplantation of elitist technology not rooted in their lives. Technological development has to be labour-intensive so as to ensure optimum use of available resources, of which labour is the most abundant.

## II. *Non-farm Labour*

The rural non-farm sector consists of five broad groups viz., (1) small-scale manufacture and repair services; (2) transport and storage; (3) trade, hotels and restaurants; (4) service and construction; and (5) mining and quarrying. This constitutes the "unorganised sector" of the rural, non-farm activities. Although this sector was not growing significantly to initiate structural changes in the rural areas, a sizeable proportion of rural employment and earnings is now generated outside agriculture, and is increasingly assuming significant proportions in the rural economy. During drought years, farm labour gets affected first, and they seek a job in the non-farm sector. With no progress in agriculture, non-farm sector will be frail. The competition among labourers for a small job market gets intensified, and the landless, manual labourers remain vulnerable.

Generally, rural unemployment does not consist of people waiting for a job. The rural unemployment in these areas is not obvious, and it often prevails in a disguised form. Further, most people seek jobs in the traditional activities within their village or in the neighbourhood i.e., in the "unorganised sector". This sector is not sufficiently growing; this resulted in low income and unpredictability of job opportunities in the villages. Thus, a large segment of the rural labour force has either remained idle or migrate to cities in search of jobs. In the urban areas, the poverty is obvious and this condition is largely attributable to lack of skills among the residents. To these difficulties in *job opportunities*, there is lack of skill learning prospects in the area. As the local surplus labour is not properly trained, many remain unemployed or underemployed or engaged in artisanal jobs. This reduced the bargaining capacities of the poor and escalated their powerlessness and vulnerability. If this trend is allowed to grow, it is very likely that imbalances in the household income will be distinct, rendering the poor more resourceless and optionless.

The bulk of the urban poor (i.e., those rural poor who migrated to the cities to eke a livelihood) belong to landless, agricultural labour, marginal farmer, artisan and service caste households. Majority of them belong to socially and economically backward communities, and artisan and service castes like potters, blacksmiths, basket makers, oil crushers, washer men, barbers or scavengers. They are substantially less literate and are more assetless. Except the necessary traditional skill in occupations that they are generally engaged, they have hardly acquired new skills and occupations. Therefore, the problems of poverty and joblessness, which have raised interest in the potential contributions of *social action groups* to development, have also increased consideration of the possibilities for assisting small-scale enterprises in rural areas. The effort to focus in an urban area and semi-urban area (that sends many migrants to the cities) is formulated.





### III. Small-scale Group Entrepreneurship

A number of small-scale enterprise development schemes have been developed over the past few decades. However, the results are not encouraging and the reasons for this sluggish growth of small-scale enterprises were numerous. Efforts that once focused on the generation of "modern", industrial firms have tended to become broad in scope and encompass greater concern for much smaller firms with less chance for growth or for eventual integration with the larger commercial and industrial sector. Credit, extension services and training continue to be the major forms of assistance, with the provision of basic infrastructure (e.g., industrial estates of 1960s) declining as a source of support.

The small-scale enterprises are often fragile ones, frequently dependent on one overworked individual. The entrepreneurs themselves lack both in knowledge of the market place and in financial reserves necessary for survival. Such difficulties multiply the problems associated with developmental intervention, and adapting businesses in a competitive setting, particularly when large institutions (e.g., bank or governments) provide a variety of disincentives for small firms while they attempt to promote the fortunes of capital-intensive businesses. The entrepreneurship training will have to consider the above factors and additionally the efforts of SAGs have to demonstrate unusual sensitivity to the need of a wide range of beneficiary, political, and voluntary sector institutions. Although the extent of their activity in practice may fall short of this goal, on the whole SAGs need to indicate sensitivity to the need for systemic planning.

### IV. Training

Poor not only remain jobless but also shelterless due to the vagaries of the job markets. Thus, they remain unorganised and marginalised in the society. The employment and income-earning opportunities available for them to progress socio-economically is little, and they might continue to be poor and unorganised for many more decades to come. Therefore, for building an effective organisation of the poor, it is necessary to emphasis on the *employment opportunities* (i.e., economic rights) and strengthen it by providing adequate training in "income earning skills" and facilitate formation of "*occupational self-help groups*" that are economically independent within that sector.

A key assumption of the general "project demonstration" approach is that upon illustration to the trainees, he/she will accept group entrepreneurship and self-help housing as a possibility. This approach has its limitations viz., *one*, just observing a demonstration is seldom enough to motivate a person to try something new; *two*, those who attempt to replicate the innovation tend to be the large-scale, richer households, while the small/marginal/poor households are hesitant and less-committed; and *three*, a demonstration generally does not give a peasant the chance to develop the knowledge and skills actually needed to implement the techniques *per se*.

The term "training" inevitably conjures up the image of two sets of actors : one possessing a certain skill or knowledge and, therefore in a position to impart knowledge to the other which does not have it. There is somewhat hierarchical connotation to this image of teacher and student facing one another across a class-room type environment with a palpable awareness of what is to be transferred from the one to the other. The image, and its implication, are not far wrong in situations where the skill or knowledge is definitive and the context in which it will be put to use is well-known.





Firstly, SAGs [and their animators] are as much dependent, if not more so, on perception and judgment of the people (i.e., target group or beneficiaries) as they are on technical skills. Technical skills may be taught, but perspective might broaden to an extent beyond which events in real life rather than knowledge obtained second-hand dictate decisions. Tools required to arrive at judgments are attained by trial and error methods only in the real world. Thus, the subject matter of training in this context is a mixture of both the tangible and intangible and, therefore, only partially definable.

Secondly, SAGs always function with reference to changing situations and are a combination of response and anticipatory action. This can seldom be stimulated in a training situation to the satisfaction of all since the reality is infinitely more complex, even daunting. Thirdly, the line between those who train and the taught invariably tends to get blurred. Trainers bring in an assortment of theoretical knowledge, analytical tools and techniques and, above all a strong sense of idealism characteristic of those who are removed from the constraints and conflicts of decision-making in the real world (i.e., at the grassroots). SAGs also carry with them a cumulate of hard-won, at times even embittered, experiences which signals a constant warning against the more fanciful notions which are offered to them. Training, in reality, becomes then a tussle between the ideal and the achievable. In the ultimate analysis, the trainers learn as much from their audience as the audience from them.

*Practice under Supervision*, a pedagogic technique encouraged by SAGs for initiating non-formal education programmes is suggested by members of CHTRDA. In proposed *skill training* for productive entrepreneurship, the following are needed : (i) skills training must not be gender-stereotyped. Instead, it needs to prepare men and women for productive, mainstream and sustainable self-employment with regular earnings that allow them and their families to escape the poverty trap; (ii) such a training for the rural poor needs to be informal, practical and appropriate; and (iii) it must be accompanied with basic entrepreneurial training that enables them to engage in micro-enterprises. We realised this wealth of potential among poor who are employed in the non-farm sector, living in the project area; we believe that this group of human potential should not just be limited to mere manual labour.

## D An Overview of Bangalore City

The *Principal Centre* of CHTRDA will be located in the suburbs of Bangalore. Therefore, we provide here an overview and the range of construction activities in that city.

Bangalore is considered to be a climatically well-favoured city in the heart of the South Deccan in India. It has grown on a ridge running through the middle of the Mysore plateau from West to East, at an average elevation of 3,021 ft (920 m). The city has a bi-focal nucleus : the city market area (west) and the Russell market area (north-east) and is connected by various railway lines (Bangalore - Madras, Bangalore - Mysore, Bangalore - Harihar, Bangalore - Guntakal and Bangalore - Salem), and several highways which serve as the quadrants of the urban spread.

During the period 1901-1991, the city area grew from 121 sq.km to 245 sq.km. About 180 villages were absorbed into the city between 1901 and 1991. Population density has increased from 149 persons per ha in 1971 to 290 persons per ha in 1991. Between 1961 and 1991, Bangalore has emerged as a major metropolis born in and belonging to the modern industrial era. The city's growth has been so rapid that in the decade 1981-91, it recorded a population increase of 40.75 per cent and stood fourth in functional ranking based on economic development indicators among the cities in India. It has firms using modern industrial technology with high capital intensity as well as sophisticated production capability.





The Bangalore Development Authority (BDA) in its Comprehensive Development Plan of 1983 proposed and identified two areas for emphasising and facilitating urban growth : to the north-east in the interstitial areas between Bellary Road and Madras Road and to the south-east in the interstitial area between the Madras Highway and the road to Hosur. The latter was reserved for industrial development to link it with the already developing industrial estate in Hosur of neighbouring Tamil Nadu. The southern and south-western areas of Sarakki and Banashankari were reserved for residential development. In the north-west the built-up area extends over a considerable distance along the Tumkur road. The infill area has been occupied by residential units.

Tracing the pattern and structure of urban growth from the initial pre-metropolitan nucleus, four types of development with pertinent processes and structures can be identified. The first type is the mainly residential leapfrogging and infilling along with "ribbon shopping and commercial land-uses" at three to six kilometers distance from the nucleus. The second type is the leapfrogging by large-scale industrial complexes, twelve kilometer from the nucleus, with residential infill along the main corridors.

Today, the city has a structure and form which is unique in many respects. The unique attributes can be short-listed as follows :

- o The city has a bi-focal nucleus from which economic corridors branch out;
- o There is an in-fill of residential areas between the two main corridors of the city; and
- o There is a central business district between two areas with a corridor infill of commercial activities at Shivaji Nagar and Majestic Circle; most of the industrial units are located outside the residential areas such as Peenya or HAL filling the peripheries with industrial units of varying scale.

The population growth in Bangalore has largely been attributed to a "push" factor of decreasing rural incomes rather than the "pull" factor of assured urban employment. The disturbing aspect is that the city's industrial structure is not generating jobs fast enough to keep pace with the inflow of migrants. Job creation at an accelerated pace, therefore, emerges as the key issue in planning for Bangalore's urbanisation, if the full benefit from the industrialisation process itself is to be realised in the larger context of national economic and social development. Creation of jobs in the formal sector has proved to be a slow and difficult process. Even the small-scale industrial activities could hardly offer any additional employment in the "formal" sector, though they attracted more *contract labourers*.

An analysis of the growth of Bangalore City since 1900 based on maps and, recently on ISRO satellite imageries indicates that the built-up area has been constantly expanding. The increase in built-up area between 1945 and 1973 (28 years) is nearly three times larger than the increase between 1912 and 1945 (33 years). The increase in built-up area between 1973 and 1980, within a span of only seven years, is twice that of the previous 28 years and has been even more dramatic between 1980 and 1985. Most of these areas have been built up at the expense of agricultural areas, and partially of barren and scrub lands, and a few water bodies.

ISRO maps and satellite imageries show that agricultural lands and plantation and orchards first became fallow and then gave way to built-up areas. Similarly, scrub areas first became agricultural areas, then barren and finally built-up areas. Between 1912 and 1945 there was a decrease in agricultural area, but the agricultural land increased between 1945 and 1973, which is mainly in former scrub and barren lands. The agricultural area has again decreased during 1973-1980. Though the city has a tendency to grow on all sides, the growth is more pronounced on the western side. The satellite imageries also show that





the drains and tanks were clogged with aquatic weeds such as water hyacinth, blocking the free flow of drainage and becoming major built-up areas with small structures. It is likely that most of these small structures are so-called "hutments".

Despite this massive urbanisation and growth of built-up area (i.e., increasing construction activities) in the city, it has about 40 per cent of its inhabitants living in slums and squatter communities spread over 900 settlements without access to basic amenities and facilities. Like any other city, the poor are denied basic right to shelter, and are forced to live in makeshift housing with no security tenure. As pressure to release land for other purposes grow, the responses of the government to this owing phenomenon has been varied - from evictions to accommodation.

To this crisis of shelter and services in the city, community organisations in different forms have emerged. These organisations have devised strategies and innovative alternatives to deal with the difficult conditions. These need to be further strengthened through studied motivation and facilitation. Enabling these communities gain access to basic needs, amenities and services along with income earning opportunities is a formidable task. On the other hand, numerous construction activities offer an opportunity for the poor to gain job opportunities, income and working towards self-reliance.

## **E Training : Contents and Processes**

The proposed training programmes of *CHTRDA* will primarily aim for progress in three categories viz., *technology, resources and local institutions*. Identifying or devising appropriate new technologies (inclusive of techniques), and then getting them effectively disseminated, are simultaneously important. This requires that the "change agents" (also known as *animators*) play a key role in the *shelter development process*; and hence the emphasis on adequately training these animators prior to the commencement of the programme. The *animators* will be identified by the local participating *SAGs*. Though there will be no formal qualifications fixed for the animators it would be preferred to nominate someone with basic education and interest in technical skills.

This depends on adequately training the *animators* who will identify themselves with the people, work with them, treat them not as object but as subjects of change and also regard themselves more as learners and be sensitive to the needs of the poor. And also they will be trained to extend more attention to those segments of the rural society which have been by-passed by conventional development programmes such as small farmers, landless, unemployed youth and women. They would initially stimulate critical awareness among the people describing the socio-economic situation and the realities confronting them, and eventually lead them on to organise themselves for concerted community action for the betterment of their conditions. The process of change that is visualised, promoted and articulated has to be the one that people themselves feel is required rather than the one that is decided for them either by the "change agents" themselves or by some external agency.

The programme planning is envisaged as a collaborative effort among government agencies and other local institutions like banks which are also keen to pursue rural development initiatives within their organisational objectives. Thus, an effective integration of governmental agencies and non-governmental efforts is proposed. The possibility of government agencies supporting the training programme (e.g., through *artisans' fund* or *rural enterprises fund*) will also be explored.





The initiatives will focus on the poorest and resourceless households. People generally proceed on their own, if the initial support and facilitation are assured. For this purpose, tasks and responsibilities will be carefully identified and shared between the producers and the external agency. The proposed "shelter development" programme includes training and practice components. The first parameter is that training be more dispersed than concentrated. There has been a tendency for programmes to recruit one person from each community to attend conventional training courses, expecting him/her to go back and relay the knowledge gained to the rest.

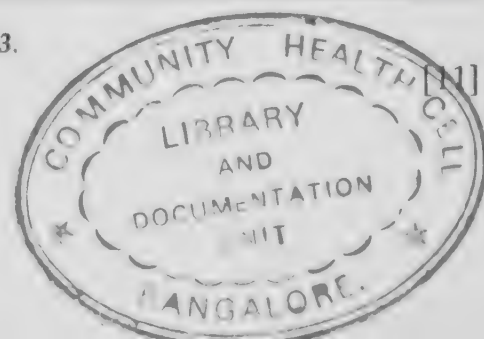
This concentrated approach is likely to create both monopolies and vulnerabilities in local institutions; when only one person has information, this can be manipulated to acquire power and advantage, whereas when others share it from the outset, the incentives as well as opportunities for diffusion are significant. Moreover, if only one person has more intensive training and leaves the rest of the community (which is likely if the training has been concentrated in him or her), then the institution receives a set-back. Therefore, *CHTRDA* has suggested to train a cadre of personnel at the village level under the forum "*self-help building communities*".

The training of the grassroots participants will start with a series of "*knowledge building*" sessions. This will aim to cultivate self- and community-confidence. Additionally, covering credit needs, marketing, community health and human relations will also be undertaken. Each *preparatory programme* will be a short self-contained unit covering a wide range of issues beginning with self-analysis, societal understanding, awareness building towards community consciousness, and constantly creating interest and enthusiasm among the participants. Many sessions are planned to be held during mid-day, making it convenient for women to participate. These short preparatory sessions would be planned by the local *SAGs* in collaboration with *CHTRDA*, but independently implemented by them.

Through the preparatory sessions, the linkage between community and government would be balanced emphasising the need for socially conscious and responsive developmental programmes. Currently, members and animators of the *participating SAGs* are discussing with the potential participants (i.e., members of the forthcoming *Self-help Building Communities*) and finalising the details of the programme (i.e., contents, schedule and participants). They have independently organised preparatory training for the *animators* in their respective project area (and for every *SAG* with whom it has plans to collaborate); some common sessions are also planned.

Intensive training in *SCHDS* system will be planned, organised and implemented by *CHTRDA* in collaboration with the *SAGs* after a thorough study of the area of work, discussions with government officials and participants themselves. This training would be projected as part of the non-formal educational activities of the concerned *SAG*, and the "job and income" component would be underplayed. The programme is planned to be undertaken amongst the rural and urban poor simultaneously.

To make our effort self-reliant and popular, we have carried out discussions and demonstration sessions with architects, building contractors and government officials in the area on : (a) inter-locking bricks; (b) our proposed training programmes; and (c) interest to supply inter-locking bricks for building construction. These professionals have tentatively agreed to participate in our endeavours and support by : placing orders for building materials with us (that we plan to produce at the worksites itself), and later depute a few of their workers to our training programmes. This collaboration will enable the participants from *SAGs* to gain an entry into the market and ensure economic independence.







## Training Framework

### 1 Preparatory Programmes [Motivation Phase]

The last quarter of 1993 and early 1994 will focus on "mobilising" people for the programme. It is proposed to organise regular modules of short duration to create a "climate of interest and enthusiasm", and is expected to result in higher retention and experiential learning. Therefore, some components of non-formal education like personality and leadership development sessions will form part of the initial, motivation programme that we describe here for reference and understanding of the proposed training process.

As described earlier, the CHTRDA's field experience and discussions suggest that the content of rural training courses must go beyond *knowledge of production*, if it is to be relevant to trainee needs, and if trainee interest is to be sustained. The participant needs to know how to use available technical services, obtain credit needed, and how to secure the required physical inputs. Finally, she/he needs to know how to market the product successfully. Hence an adequate data-base would be established that would collect, collate and disseminate required information. Therefore, in this phase basically aims to create enthusiasm and at the same time build a "team" concept among the participants. During this period participants generally understand each other, stress in a team effort, introduction to building materials production [various new efforts] and potentials for group entrepreneurship.

The preparatory programme will commence for the *Motivator-Facilitator* would be acquainted with the concept of "*skill development and enterprise promotion*". This will help them understand the needs of the target group members. The components would be :

- a. entrepreneurship and economic development;
- b. process and stages of becoming successful entrepreneurs;
- c. gender-based issues, approach and problems involved;
- d. competencies and motivation concepts; and
- e. training dynamics and youth/adult learning theories.

Such a conceptual knowledge will help the *motivator-facilitator* adopt the required approach and orientation in bringing effective changes and in identifying factors which hinder effective training. To enable them perform the assigned roles effectively, she/he would be trained in following skills also :

- i. Presentation and communication skills;
- ii. Sensitivity to the needs of other people (to fulfil the individual needs);
- iii. Technical/managerial and counselling skills.

### *Programme Curriculum*

We will rely on our past experiences and those learned through such efforts that will enable us to formulate a comprehensive curriculum for the current proposal. For purposes of gaining a better understanding, a few samples are presented here. Developing a curriculum for "women and youth" was a difficult task, but now eased by the increasing availability of adequate material. Certain specific features are considered vital to any training programme of women. They include : relevance and limitations of pursuing economic rights, women's/youth's diverse realities; female subordination; perception of women's role in development theories; attitude of administrators; and direction.





## *Proposed Training Curriculum for Phase I*

### (i) Social Awareness Training (General)

- o Leadership and nature of leadership;
- o The philosophical core of "development";
- o The essentials of *CHTRDA*'s efforts;
- o Societal Analysis (special reference to local situation);
- o Causes for socio-economic problems;
- o Purposes of education;
- o Characteristics of learning and skills; and
- o Skill as a facilitating factor for rural development.

### (ii) Leadership Training

The session begins with the resource person briefing the trainees with respect to formulation of the programme objectives. Commonly, the trainees are asked to respond to a single question, "What is the most important developmental need ?". As a second step, trainees are asked to respond in writing during the first hour of the actual programme to the following questions : "What is your most important developmental need ?"; "What do your local leaders think is the most important developmental need ?" The feedback is provided to the trainees collectively which serves to heighten the impact of the process.

This is followed by an assignment concerning the intended role of the trainee. At the beginning of the second session, the trainees are invited to express to the group various roles, attitudes, and behaviour they expect the trainer to play or portray for them. There are listed out on a flipchart; then a previously-prepared set of intended roles are prepared and shared with the trainees during the session. Generally, the trainer (facilitator) does the following :

challenges thinking; summarises; shares suggestion; provides examples;  
serves as a model; questions; guides discussion; restates suggestions/concepts (in simple terms);  
provides constructive criticism.

### (iii) Training Curriculum (*Examples*)

Generally, the contents of the training programme will be divided into a few phases and components. The overall components are :

Ice breakers; Eliminating preconceived notions; roles of a good trainee; overcoming trainer fears; presentation; self-thinking; decision-making; motivation exercises; self-concept (positive self-image); learning (patterns of learning, consciousness & competence); reading exercises; listening and following directions; problem solving and creativity; participatory Evaluation; and transfer of training.

Each of the above will aim to transmit through a game followed by a discussion and follow-up exercise. This generates a number of new ideas and encourages group participation establishing a positive climate and spirit of cooperation; this introduces team work into group activity.





**Training Schedule for the Trainers  
in Building Materials Production  
and Construction Techniques**

*(preparatory phase to be organised by SAGs)*

Learning Objectives	Contents	Activities	Expected Results
To stimulate a discussion on shelter issues	An exposure into housing shortage, materials and money.	Discussions News clippings	Better understanding of housing issues as related to their development.
To motivate for participation	Provide examples of positive direct action strategies	Case studies Visual aids Group discussion	Avenues for their participation in self-help housing
To enable them make necessary preparations at community level	Self-help housing features  To identify local natural building materials  To discuss within the community on the significance of self-help housing as sources for job, vocational training and self-reliance building opportunities.	Listing of possible Direct action areas  Strength and weaknesses; and how to overcome  Visit to some self-help housing projects  Self-assessment	An estimate of available resources; job opportunities & strengths of group entrepreneurship in housing materials.  Some initial efforts.





In an attempt to reduce the basic weakness of the demonstration approach, a field extension system is proposed to encourage participants in the *shelter development* by direct interacting with the animators of SAG and CHTRDA. *First*, the current proposal aims to train a cadre of the local community as "experts"; *second*, the approach does aspire to stimulate the participants to begin organising themselves and taking responsibility to meet their needs. To overcome the practical difficulties the trainers would motivate the participants to build *Community Centres* in the area.

The *skill and empowerment* part of the training programme will be conducted in a phased manner. In the first phase, all the potential entrepreneurial animators will undergo training at CHTRDA for a period of one month. During the *initial period* of the *second* phase the participants will undergo simultaneous training programmes for selected building communities and individual entrepreneurs within their regions of operation under the guidance of CHTRDA trainers. Both these training phases will have two distinct stages of operation viz., the first stage will be a series of practical exercises in the production of building materials; and during the second stage the participants would construct built-up units (tentatively planned to build an office-cum-workshop unit for CHTRDA). Thus, materials would be produced and used by the participants, allowing a praxis. Upon successful completion of Phase I, each participating SAG will receive a complete set of SCHDS unit to enable them carry out independent on-site exercises and similar training programmes for other residents in their project area.

Thus, the participants as a group will be motivated to take responsibility for solving their own problems and self-reinforcing process of community development emerge. The key ingredient of this process is *skill and local leadership development*, and training through the creation of problem-solving groups. In this process the poor would be encouraged to develop greater self-reliance that facilitates the formation of local groups, relying only on carefully trained "animators" as catalysts and resource persons. The long-range goals of such an initiative are : (i) identifying, recruiting, and training village-level leadership; and (ii) designing and stimulating mechanisms to reinforce the process of participation among various sub-groups (e.g., landless peasants, women, and youth) of the village community. Within these objectives, the concepts of *leadership* and *participation*, which represent a set of significant preconditions and difficulties of that village community to be challenged are built in.

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<sup>2</sup> For a detailed discussion on the training in building materials production, please refer to *Enclosure B*.





## Intensive Training Phases

Phase	Participants	Learning Contents	Remarks
One	Animators and key personnel of SAGs <i>[Training would be organised at CHTRDA Centre in Bangalore]</i>	<p><b>Step 1 (15 days)</b></p> <p><i>Learning by Doing</i></p> <ul style="list-style-type: none"> <li>o Identification and procurement of raw materials;</li> <li>o Production of building materials. <i>(processes and methods)</i></li> </ul> <p><b>Step 2 (20 days)</b></p> <ul style="list-style-type: none"> <li>o Construction of model units. <i>(practice under supervision of CHTRDA Trainers)</i></li> </ul>	The contents include : identification of suitable soils for brick-making; introduction to SCHDS machinery and moulds, handling, production methods and costing techniques etc. Materials produced will be used for construction of demonstration units.
Two	Village level potential members of the <b>Self-help Building Communities</b> <i>[Training would be organised in the project area; this part of the programme would be financed by the respective SAGs]</i>	<p><b>Step 1 (15 days)</b> <i>[Former trainees now train others in their area]</i></p> <p><i>Learning by Doing</i></p> <ul style="list-style-type: none"> <li>o Identification and procurement of raw materials;</li> <li>o Production of building materials. <i>(processes and methods)</i></li> </ul> <p><b>Step 2 (20 days)</b></p> <ul style="list-style-type: none"> <li>o Construction of demonstration units. <i>(under the supervision of CHTRDA Trainers)</i></li> </ul>	Animators (in collaboration with SAGs) will plan, organise and conduct the training for members of <i>self-help building communities</i> under the guidance of CHTRDA. Materials produced will be used for construction of community centres or a few residential units, as is deemed appropriate.





Phase	Participants	Learning Contents	Remarks
Three	Representatives of the Self-help building Communities	<ul style="list-style-type: none"> <li>o Forming building cooperatives and micro-enterprises;</li> <li>o Marketing building materials and strive for self-reliance;</li> <li>o Feed-back and system evaluation.</li> </ul>	To be monitored and moderated by <i>CHTRDA</i> along with <i>SAGs</i> .

### 3 Building Community Centres

At the village level, one significant proposal is to promote the building of "*Community Centres*" mainly out of the materials produced during the training process. Such a *Community Centre* would enable the formation of socio-educational groups starting with small, self-directed training programmes built around the immediate needs of women/girls. The approach is to support the formation of "self-help building community" groups and simultaneously, implement a specific, short-term non-formal and informal training modules in the production of building materials. The strategy is that, eventually, the village level groups would become *self-reliant* and will have the capability to tap creative potentials among the households allowing the *SAGs* to focus specifically on shelter promotion issues. After consolidation of this initial response, the trainers and participants will tabulate the shelter issues in the area within the framework of socio-economic development in the region, and identify spaces for concerted action.

The long-term objective of the *Community Centres* is that the various components become rooted in the local area enabling *CHTRDA* to withdraw in a phased manner. Keeping this in mind, *CHTRDA* plans to focus on three major activities between 1994 and 1997 (1993 will be the preparatory period) :

- a. Linking up trained and active "animators" with existing government service systems and/or with people's organisations for future follow-up action;
- b. Strengthening existing people's organisations to make them effective, self-reliant and viable institutions that will enable the rural people to actively acquire the goods and services they need for long-term development; and
- c. Transfer management of the *SCHDS* and *Community Centres* to local people's organisations to the extent that they feel that the centre's activities are relevant to their needs.

This direction will be accompanied by a series of training programmes, viz., on-site to supply building materials to builders and leadership development among the participants towards formation of co-operatives and empowerment with a special focus on institutional development. Through this process we hope to establish structures, procedures, and abstract performance capabilities, more appropriately, assimilating people's concern with their skills, motivation, and personal efficacy. In practical terms, when one thinks of building or strengthening institutions, it is necessary to figure out how talents and energies of the people can be enlisted, upgraded and committed on a regular basis to their co-operative functioning and progress. Following a process of *learning by doing* i.e., practice and concept of participatory learning and community activity (i.e., community training and production of building materials; formation of cooperatives; self-help housing) the participants are expected :





- a. To gain and develop skills in building materials production and construction techniques along with appropriate attitudes and values inherent in participatory learning.
- b. Build models for participatory learning based on their workshop experiences and compare their models with the existing ones.
- c. Design or redesign community development approaches for specific needs recognised by them in their own villages (i.e., formation of cooperatives or micro enterprises);
- d. Develop a cadre of personnel within each village and its neighbourhood, with skills to function independently as *"self-help building communities"* and serve as community leaders.

#### 4      *Follow-up*

To determine the cost effectiveness of the programme a measure, however rough, is needed of educational results as well as benefits (such as income increases) attributable to that programme. At present no attempt has been made to standardise measures. Admittedly this is a difficult task as a large number of trainees will be illiterates. A number of attributes are planned to be developed along with the participants to enable *CHTRDA* measure the impact of the programme.

A series of follow-up training programmes will be undertaken to maintain interest and enthusiasm among the participants, and facilitate overcome difficulties that they might face.











### ***Enclosure A***

- o Building Materials Production and  
Income-Generation Among the Poor***
- o Urbanisation and Shelter for the Poor  
A Participatory Research Initiative***









***Building Materials Production and  
Income-Generation Among the Poor***





In recent years, *access of the poor to adequate, affordable and appropriate shelter and basic infrastructure* is a subject that has received immense attention. A large segment of the poor live in dwelling units that require massive rehabilitation or outright replacement. Rather than improving with time, the situation is steadily deteriorating, although over the years, efforts have been made by governmental and non-governmental organisations at improving the low-income shelter situation. Perhaps, it is the sheer magnitude of the requirements for shelter and infrastructure for the poor (and low-income population in general) that has caused the problem to persist and, in many cases, to get worse.

Construction sector<sup>3</sup> has multiple roles in socio-economic development of which provision of employment opportunities, infrastructure facilities and shelter are important. With adequate institutional and state support this sector is expected to contribute significantly towards the progress of the society, especially in the rural areas where agriculture is steadily stagnating.

Construction sector is responsible for providing the main physical investments in human settlements, i.e., civil engineering works such as dams, roads and harbours - and buildings for a multitude of uses such as industries or places for community purposes (i.e., schools or hospitals). The main indications of underdevelopment are the lack of investment in or inadequate provision of basic physical facilities. The construction sector is, thus, a primary tool for raising the level of development in most areas.

However, construction sector in India has been performing sluggishly, and the reasons for that could be briefly summarised : it is largely dependent on imported inputs which are prohibitive in cost, provided in insufficient quantities or based on inappropriate standards, so that the industry operates far under expected (or needed) capacity. While the poor performance of the construction sector affects the entire population, the most disadvantaged is the low-income population whose livelihood is inexplicably integrated with it. There are several dimensions to this growing inadequacy of the construction sector and resultant difficult conditions of which two important issues deserve our immediate study : (i) availability of employment opportunities; and (ii) access to affordable and adequate housing.

Construction of building and residential units offer more employment opportunities, both direct and indirect, than any other sector of construction. Also, a number of studies and valid observations have established that low-cost housing is more labour-intensive than multistory housing. Low-income housing is, therefore, an important source of employment opportunities. However, increasing the production of low-cost building units cannot be achieved without ensuring an adequate supply of suitable construction materials<sup>4</sup>. An increase in the output of construction materials will naturally boost employment opportunities for the unskilled and manual labourers, who form the majority of the poor.

Constructing simple low-income housing units or producing locally usable building materials will provide an entry point for learning skills and an opportunity develop experience. This is portentous because it not only offers employment opportunities but also the potential for new enterprises to start and grow, to develop skills through experience and to increase their productivity. The use of local materials builds self-confidence and employment opportunities in the manufacture of the building components and creates backward links in the supply, preparation and transport of the raw materials. The local manufacture of building materials is commonly labour-intensive.

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<sup>3</sup> Generally, the words "*construction industry*" and "*construction sector*" are synonymously used to mean similar activities and functions. However, for purposes of consistency we prefer to use the term "*construction sector*".

<sup>4</sup> The terms "*construction materials*" and "*building materials*" refer to same or similar products. However, some commentators suggest that the term "*construction materials*" refer to a larger segment of the building materials and elements. For purposes of consistency and reference to a larger segment, we use the term "*construction materials*".





There are many examples of building materials being developed which can be manufactured on a small-scale adopting labour-intensive techniques that rely on local raw materials and do not require skilled labour. Incentives and technology are not lacking but they so often remain at the experimental stage due to lack of promotion and dissemination of information. Construction sector (and notably the building section) aims to be equipment-intensive. Generally, the choice of technology and design criteria tend to support western models that are highly capital-intensive, even when labour is plentiful and inexpensive. Moreover, these methods depend on a high proportion of imported machinery and materials. Usually, one observes the dominance of vested interests in equipment and "modern" building methods, a situation in which these methods are regarded as the norm and a desire to avoid the problems which can result from the employment of large work-forces.

Large and medium-scale contractors are preferred by governments and by private housing developers who are anxious to meet time schedules and deadlines. Therefore, they use mechanised methods and imported components in preference to labour-intensive and locally-made materials. The employment creation in this sector is limited. Small-scale contractors are more in number, and frequently meet unequal competition from medium and large-scale contractors. In some instances, labour relations can lead to difficult situations which most contractors would rather avoid and the desire of many governments to enforce minimum wages can simply a shift to capital-intensive methods. This dilemma is distinctly noticeable among the building contractors.

Despite the considerable amount of work that has been done on the development of construction materials which use local raw materials and which can be manufactured on a small scale using labour-intensive methods, almost nowhere are they being used on any significant scale. Also, inappropriate building codes and standards, consumer resistance and problems of balancing supply and demand, offer additional challenges. Consumer resistance tends to be high among the low-income groups as they cannot afford to experiment something in which they have no demonstrated confidence. Some even scrutinise the "resale" value of the building. Hence contractors and builders are universally conservative about the materials they use and are reluctant to trust any which have not stood the test of time.

The use of new materials in the construction of community buildings such as schools and medical clinics is often important in overcoming consumer resistance to the use of the materials. Once durability and utility is established, demand for the products become stable, and new materials-producing units can be started and it is essential that these are able to maintain consistency both in terms of quality and quantity if they are to succeed. This transition stage requires technical, managerial and financial support from the intervening agency (e.g., NGOs).

Past experience indicates that house building is a principal source of employment opportunities and income generation. A house is a financial asset and an entry point into a stable economic well-being of the household. A house can be used to provide security for credit, a space to rent or a place in which to engage in economic activities. Therefore, residential units do not provide simple shelter; they provide infrastructure and a place for the establishment and development of small-scale economic activities. Thus, a package of "economic rights" could be predicted.

It is in this context a new developmental intervention i.e., *shelter promotion network*, is proposed to concentrate on improving the access of the poor to income and housing through a series of skill development (and entrepreneurial promotion) activities. It is inferred that if employment and income generation activities are to be encouraged at micro level settlements, strategies must be adopted which will include :

- \* animating self-supporting neighbourhoods
- \* stimulating income-generating opportunities
- \* encouraging income-generating opportunities in the production of building materials











**Urbanisation and Shelter for the Poor**  
(*A Participatory Action Research Initiative*)

*M S Shivakumar*  
*Koen De Wandeler*

*January 1992*



## A. Introduction

This proposal evolved out of our continuous dialogue with various NGOs and concerned individuals who are involved in responding to urban issues that affect the poor. This exchange suggested that the present state of urbanisation, notably the infrastructural problems and the emerging housing crisis, is characterised by organisational deficiencies and a lack of proper information systems. The present situation is most likely to aggravate if due attention is not given to thoroughly understand the major forces that direct the current urbanisation process. In order to develop strategies which would preserve the access to affordable shelter and a decent standard of living in the present condition of urbanisation, government agencies and NGOs need a comprehensive understanding of the various components of urbanisation such as housing industry, informal sector activities, availability of infrastructural facilities etc.

This paper outlines and proposes a series of activities which aims to contribute towards a better understanding of urban issues, and to provide a valuable source of information for all concerned individuals and institutions. As in our earlier research efforts viz., "street children" and "construction workers, which have generated adequate information to support NGO initiatives (e.g., *Legislation protecting the welfare of construction workers*), this study is action-oriented to evolve formulation of positive policies and programmes.

The proposed series of studies aim to look at the historical, spatial and socio-economic aspects of urbanisation in Bangalore and adopt new perspectives and methodologies that have emerged through global debate on sustainable alternatives in development.

As the situation of the urban poor constitutes one of the core concerns of urban management in the Indian cities, the study will focus on those aspects of urbanisation which directly affect the living and working conditions of the urban poor. The study will review their status as an integral part of the overall development scheme which has been shaping the region, taking into account social, economic, cultural and environmental aspects, and framing it within the national and international context.

## B. Problem Formulation

Many nations have pursued industrialisation in order to achieve beneficial production effects such as higher income levels, greater foreign exchange, more and higher paying jobs and multiplier effects. This industrial growth was initially characterised as an economic activity that employed relatively simple technologies and could draw on abundant domestic labour supply and natural resources. A significant side-effect of this industrialisation was the rapid growth of the urban centres. However, this growth has proved to be highly fragmented, inadequately monitored and seriously misunderstood. Apart from obvious adverse socio-economic consequences, this has resulted in increasing economic and social disparities and non-participation of a large number of people from the mainstream development.

After independence (1947) India's developmental efforts were focused on rural issues. The principal challenges in rural development then were :

- (i) Sustaining growth in the high growth regions and extending it to other regions with favourable conditions;
- (ii) Evolving a suitable strategy for accelerating economic growth and development for the dry regions of India which have so far experienced slow growth or stagnation, and
- (iii) Coping successfully with the social and political tensions generated by rapid economic growth.





However, failure to formulate suitable rural development policies and adequate strategies for their implementation have led to large scale migration of the poor rural households to cities creating an "urban chaos". Whereas significant progress has been made in formulating a strategy of rural development since 1960s, similar progress has not been made in evolving a suitable strategy for management of urban growth. The resulting urban situation is characterised by :

- (a) Increasing unemployment and underemployment in the cities and very low productivity in the informal sectors which have had to absorb most of the "in-migrants".
- (b) Acute shortage of housing and increasing pressures on urban services, which have led, in turn, to increasing congestion, and proliferation of slums. The great majority of the population in cities have to live in conditions of extreme squalor and misery, and
- (c) Progressive deterioration of the urban physical environment.

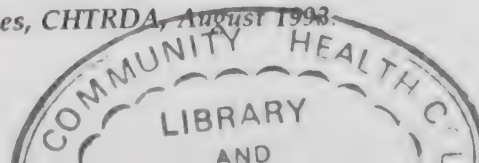
Confronted with the growing complexity of urban management and the difficulties in maintaining an equitable distribution of access to resources and services, government agencies tended to expand their scope and levels of responsibility. This institutional set up grew obsolete and became so complicated that conflicting objectives and overlapping responsibilities came to seriously hamper the formulation of adequate responses to the problems arising from rapid urbanisation. More emphasis was placed on the identification of proper tasks and procedures for implementation rather than addressing the difficulties in maintaining equitable distribution of access to resources and services.

With the sizes that Indian cities - Delhi, Bombay, Calcutta, Madras and Bangalore - have attained already and their projected growth in future, a comprehensive basis for urban planning and management is an essential need for these cities. Given the need, task, and resources, how a complex planning problem of this dimension and complexity could be tackled ? How are its numerous diverse elements compared and synthesised ? How could alternative or optimum solutions be derived ? What are the best methods of analysis ? It is obvious that within the next decade the emphasis of the urban planning will be on organisational methods and specific techniques to respond to these issues.

Developing suitable strategies for management of rapid urban growth occurring in Indian cities (e.g., Bangalore) constitutes a major challenge for development-planners and policy-makers. The strategies must satisfy two essential conditions. *First*, they must contribute to meeting the needs for gainful employment, housing and essential services of the rapidly increasing urban population at acceptable economic and social cost. *Second*, they must ensure that urban growth contributes to national and regional economic growth, particularly through multiple, growth-inducing urban-rural interactions.

The strategies will require advances in several directions, but principally in developing (a) a planned pattern of urbanisation that is better adapted to serve the economic and social conditions of India than the wildgrow which has been allowed to develop during the past decades; (b) lower-cost technologies of construction and of delivery of urban services; and (c) administrative structures which are politically acceptable as well as suitable for management of large urban systems.

To develop these strategies it is necessary to evolve a comprehensive analytical framework which takes into account the roles and attitudes, the accepted value systems and development ideology that influence decisions regarding urban planning and land use. Moreover, it would require a thorough knowledge of the problems of the Indian urban society, notably of the structural nature of urban poverty, to formulate guidelines that may lead to their solution. However, at present, urban areas obviously lack both monitoring of inputs and outputs (financial and physical) and that of so-called "impacts" of development activities. Planners, researchers and concerned individuals (including NGOs) lack sufficient data and information as conventional methods of information gathering, processing and dissemination have proved to be inadequate.







Simultaneously, there has been renewed emphasis on the study of social conditions and on monitoring social change in the urban areas, whether or not related to specific project activities. There is a need to know whether people, particularly the poorest in the urban centres are faring better or worse as regards basic services, housing, income and livelihood, how individual groups and sub-groups are affected and what are the factors responsible. At the same time, there are all the symptoms of a crisis with respect to social monitoring of urbanisation and housing market in the cities.

In this sense, the failure of strategies to adequately address urban problems could be attributed to both organisational deficiencies, and lack of reliable and appropriate information systems. Therefore, there is a need to search for new ideas and concepts. In such a situation, it is necessary for the concerned organisations and individuals to place themselves in local situations, and pursue a series of studies on issues of development in urban areas. The current concerns of the urban development has moved into the centre of the development debate focusing on injustice, poverty, marginality and dependence that still haunt the lives of the urban poor. We need to clarify the causes and identify mechanisms for appropriate action. For such a process, Bangalore city serves as a good case study area.

Currently, the studies are undertaken in and around Bangalore. Bangalore is one of the fast growing metropolis, currently registering an average annual growth rate of 8 per cent and a total population of over five million (1991). This city is experiencing rapid and unforeseen changes in its urban fabric resulting from massive urbanisation that remains unabated since early 1970s. The city has severe shortage of basic amenities and facilities (e.g., housing and other services).

A systematic study of the urban landscape of Bangalore would mirror the contradictions, evils and ills of the present Indian society, namely economic and social disparities, increasing deprivation of resources and alienation of the mass of people. Many view urban growth in Bangalore with considerable alarm. There is concern that this city once a symbol of "beauty, serenity, gardens, security and good life" is fast degenerating into a "chaotic conglomeration of human beings living in a state of uncertainty, disintegration and without a sense of belonging". The cause of this concern is varied. For some, it is the mechanical and automated lifestyle; for others, it is the alarming influx of migrants into the city who are seeking to gain access to livelihood resources and urban services.

### C. Organisation of the Research Programme

The proposed research is based on the appreciation of the fact that the urban areas, as a system capable of supporting humankind, will face severe strains if proper action plans are not formulated. It is designed as a programme to promote research and systematic discussion on a broad range of urban issues (that might independently stand out) the implications of urbanisation in general, focusing on the particular case of Bangalore.

We would focus on two broad research areas : (a) actors and (b) conditions that influence the formulation and implementation of urban development policies. Besides identifying the different forces that contribute to the creation of a certain urban or social development policy, we would attempt to determine and clarify the reason why certain issues were included as components and others excluded. This requires examination of the socio-political realities, the character of the decision-making process, values and perceptions and the conflicting interests.

Initially we plan to conduct a series of research studies on the relationships between various types of social and economic development during different phases of economic growth with particular attention to urban and housing issues. The *objectives* are : (a) to test the urbanisation trends and policies for monitoring change in socio-economic conditions and (b) to examine the inter-relationship of various factors in the development process and propose suggestions for planning and policy-making.





This research series would comprise three major areas of action :

#### **Area I : Progressive assessment of the urban area**

This area of action would be responsibility of the Animating Group based at Bangalore and their partner-researchers. This group would introduce the integrative conceptual framework of the programme and identify the urbanisation trends. The emphasis will be on ecological, socio-political and cultural aspects of change and change-agents, particularly in terms of individual and community perception.

Publications arising from this activity will include a background volume on the city's urban issues, particularly housing and pertinent questions.

#### **Area II : Substantiation and verification of the assessment through research studies**

This part of the programme would address specific issues raised in the overall assessment of urbanisation (see part I). It would be carried out by specialists in various disciplines who could substantiate and verify these issues through field work and systematic documentation. The principal issues to be addressed would include : economic arrangements; social organisation; value system; education; built environment and ecological sustainability and education.

In some cases, researchers could invite and coordinate contributions from a number of individuals within their own general field of interest. Workshops could be organised to bring people interested in a particular theme for discussion and debate. This would provide an opportunity for the researchers to present their findings for wider debate.

#### **Area III : Integration, synthesis and policy recommendations**

This part of the programme would consider the outputs of the earlier activities and analyse the results. It would regularly publish a synthesis of the progress made for larger circulation and reference.

Therefore, this proposed research study includes not only basic work on fundamental problems, but also policy-oriented research, and more instrumental studies mainly in the field of measurement and qualitative analysis of social processes.

### **D. Identified Areas for Research**

Presently we have identified following research areas for indepth inquiry; further identification of research areas would continue simultaneously. The studies currently in progress are :

- a. Impact of urbanisation on residential architecture : A case study on courtyard houses;
- b. Speculative building practices : Its impact on the housing situation of the urban poor;
- c. Working and living conditions of hawkers/street vendors in Bangalore : Formulation of positive policies.

### **E. Expected Results and Impact**

#### **Targetting the Prospective Users**

As a study that emerged out of continuous dialogue with concerned individuals (academics, policy makers and others) and NGOs this exercise has multiple relevance. Unlike many a piece of research which make little or no impact and thus remain academic exercises of the art-for-art's-sake category, the





proposed programme is geared to be used, and its findings will be scrutinised to provide action-plans for the concerned organisations and individuals. The major users of the findings can be distinguished as institutions and individuals : local people's organisations, supporting agencies, state institutions and academia.

a. Institution building & policy making

Considering NGOs and various state agencies as the institutions concerned, this programme would provide valuable information required for the planning of action-policies in the medium and long range. This information will suggest adequate and appropriate implementation procedures for innovative action-plans. The results will also influence the format of policies/programmes to apportion resources and area of emphasis.

Useful byproducts of the programme include the updating of the institutional data bases and dissemination of these for free use and reference to create awareness among public. The major concerns of this programme are a two-pronged, two-tiered and reciprocal means of generating and exchanging valuable information required for city planning. The administrators and policy makers, in turn, have the means and mechanisms to evaluate the performance and contribution of the studies to city planning. In this manner, the acceptance of the recommendations proposed remain under continuous scrutiny.

b. Development Agencies

A multifaceted approach is expected to create interest among research organisations and individuals (including NGOs) for a continuous search to identify realities and social processes. The donor agencies will gain better insights into the indicators of past accomplishments, current needs, and future directions based on the aggregation of "needs" directly or indirectly required for comprehensive city development planning.

c. Others

For the urban poor themselves, these studies are means and opportunities for communication on matters of mutual concern and interest. Not only are they an occasion for reflection on the past experiences but also an occasion for critical review, constructive advice, and deliberation of future directions. The benefits which people derive from such active participation in the study will strengthen and uphold an active and functioning relationship; recognition of their status as invaluable partners in development and source of primary information and competent advice.

The proposed studies alone cannot possibly generate all the data and information required for the planning and tackling "problems of the city". Various other studies form part of the complementary fact-finding that may have to be and are routinely carried out in such circumstances. These complementary activities include research studies by students on a multi-disciplinary basis. In summary, the studies are expected stimulate an active interest among concerned institutions and individuals leading to :

- \* Creation of new concepts and deeper insights into various characteristics of urbanisation;
- \* Active dissemination of information/data gathered and results arrived at;
- \* Supporting campaigns for policy formulation.

F. Complementary Activities

As stressed earlier, these studies alone cannot possibly generate all the data and information required for the planning and management of any urban centre. Various other studies form part of the complementary fact that finding that may have to be and are routinely conducted by any policy making





agency. These studies include specific "urbanisation" or "housing" issues, analyses of time series data bases, a trend analysis, and a strategy study.

We were able to encourage students from various disciplines to carry out research studies that would supplement our efforts. For example, masters' students of sociology from have undertaken studies to understand the character of slums in the city; architect students from St Lucas, Belgium are currently researching into "residential architecture" of the pre-colonial houses and the impact of urbanisation on those units; students from Mysore University are exploring the possibility to do a survey of the retail trade centres in Bangalore.

#### G. Time Schedule

Exploratory work for the studies have begun in June 1991. Efforts are being made to consolidate earlier research works. Second phase of the work commenced by May 1992 and will run through 1995. Continuously areas for research will be identified and findings simultaneously published.

#### H. Institution and Personnel

*Collaboration* has been developed with various research institutes and individual researchers in order to foster exchange of information through discussion and validating field data. In addition, principal researchers constantly maintain a close contact with urban planners and experts at various levels. During the initial period of exploratory work the researchers were based at Indian Social Institute, 24 Benson Road, Bangalore 560 046 (India) who are actively involved in training, documentation and research in community development activities; ISI also closely animates various initiatives of many NGOs in south India. Regular animation sessions were maintained with other concerned individuals.

For purposes of data collection and other logistical support we are closely associated with following NGOs working with the poor :

- \* Karnataka Kollageri Nivasigala Samyukta Sanghtane  
(Karnataka Slumdweller's Federation)
- \* Women's Voice;
- \* Association for Voluntary Action & Services;
- \* Karnataka Construction Workers Central Union;
- \* Bangalore Domestic Workers' Cooperative Union;
- \* Community Health Cell;
- \* Mythri Sarva Seva Samithi;
- \* Institute for Social & Economic Change;
- \* Institute for Development Studies, Mysore.
- \* Workers Education and Development Society, Bangalore.

This research study is the joint initiative of Koen De Wandeler, architect and M S Shivakumar (presently with the *division of human settlements development*, Asian Institute of Technology, Bangkok, Thailand).

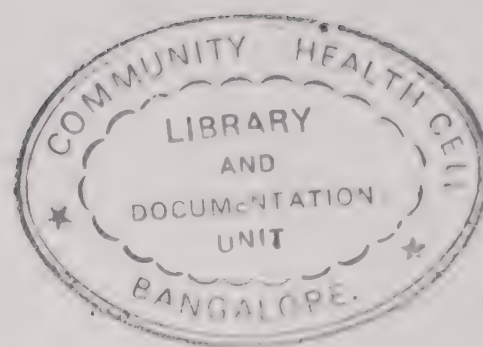
(For a status report refer to the "progress review" of this research initiative of December 1992)











***Enclosure B***

- o Self-Contained Housing Delivery System (SCHDS)*
- o Mud Housing : A Survey of Traditional Houses in Southern India*

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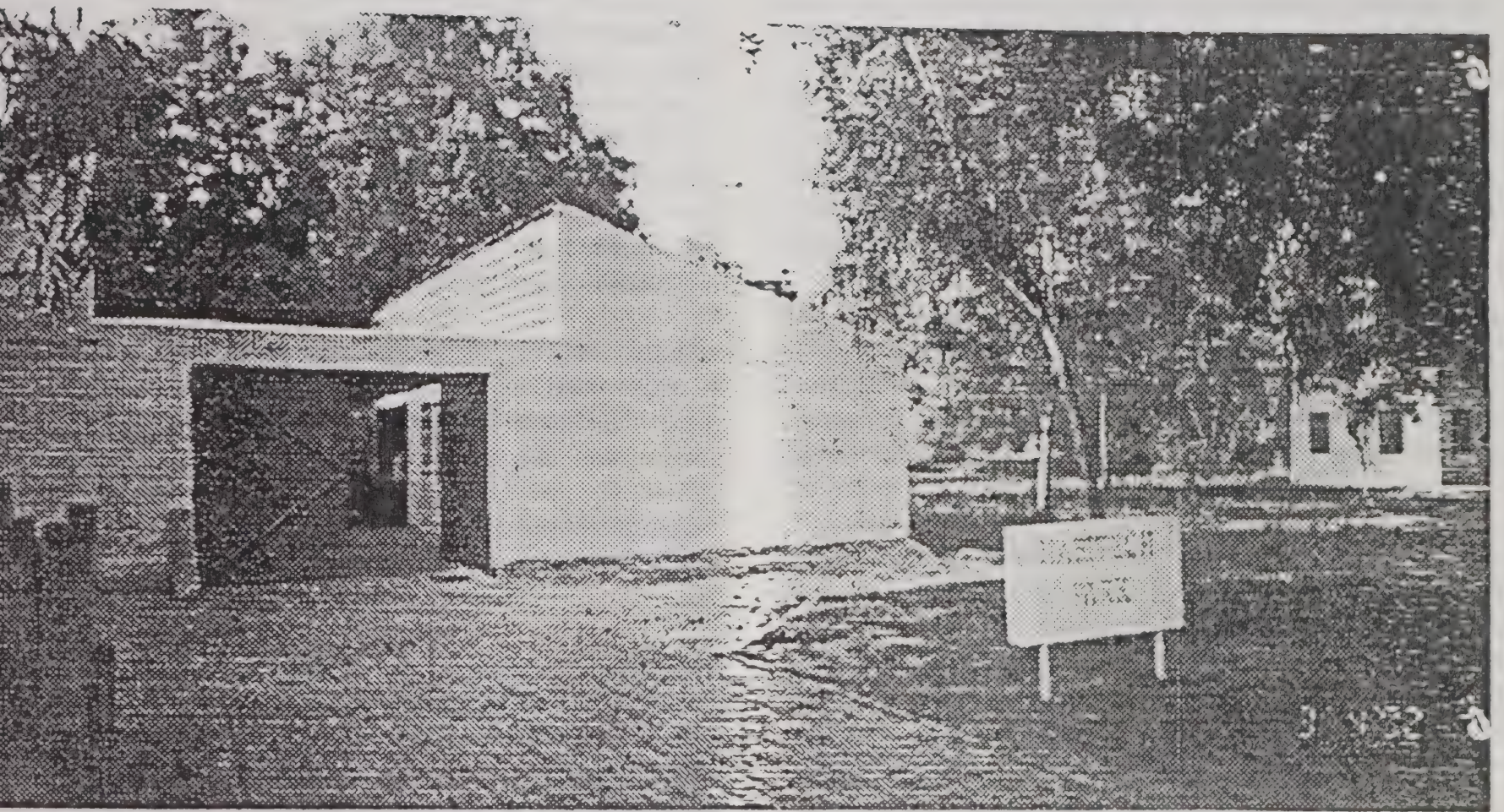








# A NOTE ON SELF-CONTAINED HOUSING DELIVERY SYSTEM



This report was prepared by researchers at the Habitech Park, Human Settlements Development Division, Asian Institute of Technology, Bangkok.





# 1 INTRODUCTION

## 1.1 CONTEXT

Attempts to solve the continuing problems of survival in the poverty stricken regions of developing countries remain intractable. Frequently these problems are a result of destruction of the environment by human settlements, the consequence of which has often been the run off of rainfall leading to drought, erosion and continued deforestation. To reverse this downward spiralling cycle and to address the broader issues of environmentally correct human settlements, the Human Settlements Division (HSD) of the Asian Institute of Technology (AIT) established Habitech Park.

Habitech Park is intended to be more than merely a laboratory for testing building materials or devising new methods for assembling low cost houses. The ultimate goal of Habitech is to seek alternate technical and environmental solutions in the development of human settlements for the next century when the population of the world will have increased from five to as much as ten billions. Obviously solutions to this problem will engage the attention of many disciplines some of whom will surely deal with the issues of environment, nutrition and health, training and livelihood, infrastructure and shelter.

Research into these aspects of human development need an inter-disciplinary approach which Habitech Park is designed to provide through cooperation with individuals and institutions external to A.I.T. such as international and national NGO'S, housing cooperatives and low income communities. The range of research, development, service and consultation activities in the field of human settlement development undertaken by Habitech is far ranging.

The level of poverty in the rural and urban areas of developing countries makes it exceedingly difficult for the poor to construct permanent and substantial housing. Thus it is evident that constructing a house must have an exceedingly modest beginning in order to make the reality of permanent housing possible. The concept of a simple basic house of substantial construction activities, represent at the same time, the main bottleneck in the construction industry in many developing countries. In terms of shelter and basic infrastructure for the poor, building materials are frequently an issue in the productivity of housing and in the self-help and community participation approaches to house construction.

## 1.2 RELEVANT ISSUES

Building materials, as the single largest input in construction activities, represent at the same time, the main bottleneck in the construction industry in many developing countries. In terms of shelter and basic infrastructure for the poor, building materials are frequently an issue in the production of housing and in self-help and community participation approaches to house construction.

So far, a large proportion of building components used in the construction of shelter by lower income groups, which constitute the majority of the population in developing countries, have been produced in small scale units. Building components produced in this manner, are related to traditional processes and can make a significant contribution to national economic development as evidenced by high employment and skill generation, as well as economic multiplier effects achieved through backward and forward linkages to other sectors of the economy.

Thus small scale building components production would by definition, have few employees, little capital investment and a limited volume of output and are very likely to show other characteristics such as production with locally available raw materials, production for strictly local markets and intermittent levels of production.

The generally low level of skills required for the small scale production of building components as well as the low cost of labor and material input and the low level of capital required to start production means that producing building components is relatively easy and presents no insuperable barriers.

The answer to the problem of low income housing lies in a housing delivery strategy employing systematized construction systems as an integral part of the informal housing industry sector. These systems should allow for the use of non-skilled labor in production and construction of the houses as well as the use of raw materials that can be transformed locally.

Such a building system has been developed at Habitech Park through research and development activities and has been made it available to institutions, communities and NGOs involved in housing. So far, projects in which Habitech Park has been involved, range from micro developments of 10 houses to large urban and village settlements of up to 150 houses including schools and community facilities.

## 1.3 GOALS AND STRATEGIES

### Goals

- i ) Continue the search for an ubiquitous housing technology that can solve the problem of housing the poor.
- ii ) Continue the search for a style and form of human settlements that does not physically deplete, through the inordinate consumption of natural resources nor aesthetically destroy our environment through mindless development.
- iii ) Continue the search for a construction technology that can sustain life without depleting or polluting the environment.





## Strategies

- i) Create a venue wherein the various disciplines concerned with the environment and with development can interact at a working or prescriptive level.
- ii) Provide the facilities for the creation of working models of hypothesized solutions for environmentally sensitive human settlements.
- iii) Provide the facilities to introduce new concepts of human habitation to students, teachers, communities, non-governmental organizations and institutions involved in housing.
- iv) Provide the technical support needed to bring fulfillment to the vision of a new kind of human settlements.
- v) Disseminate the work of Habitech Park through world wide networks.

## 2. SELF-CONTAINED HOUSING DELIVERY SYSTEM

### 2.1 SCHDS (BUILDING SYSTEM)

Originally conceived as a method of providing demountable fire, wind and earthquake resistant shelters for use in natural or man-made disasters (including squatter eviction and resettlement) the SCHDS system developed at Habitech Park has grown to be an inexpensive, quickly and easily erected housing system whose costs consistently undercut by 30 to 50 % conventional construction systems.

Compatible building components have been successively added with the objective of creating a complete modular interlocking building system especially suited for construction by unskilled labor. Furthermore, to eliminate the need for heavy construction equipment, all the components have been designed to be lightweight, requiring no more than four persons to manually place each component in place without the need for complex equipment thus reducing the requirement for capital investment.

So far all housing projects and demonstrations houses built using the building system have used inexpensive moulds and hand machines making the technology labour intensive and particularly well suited for small scale projects.

The rapid rise in the cost of timber and the equally rapid depletion of forest reserves with consequent aggravation to the environment make imperative the use of alternative materials to replace the use of timber in the construction of housing, particularly for the lower income sectors which makes wide use of it.

Considerable progress in this direction has been achieved with the development of the construction technology which has

successfully substituted composite construction for wood in floor systems, roof systems, in the frames for doors and windows and stringers and treads for staircases. As proof of these successful substitutions, the costs of housing built with system is considerably below that of conventional house construction. As the building system spreads throughout the region the beneficial reduction in the consumption of timber products for construction may lead to a salutary effect upon the environment.

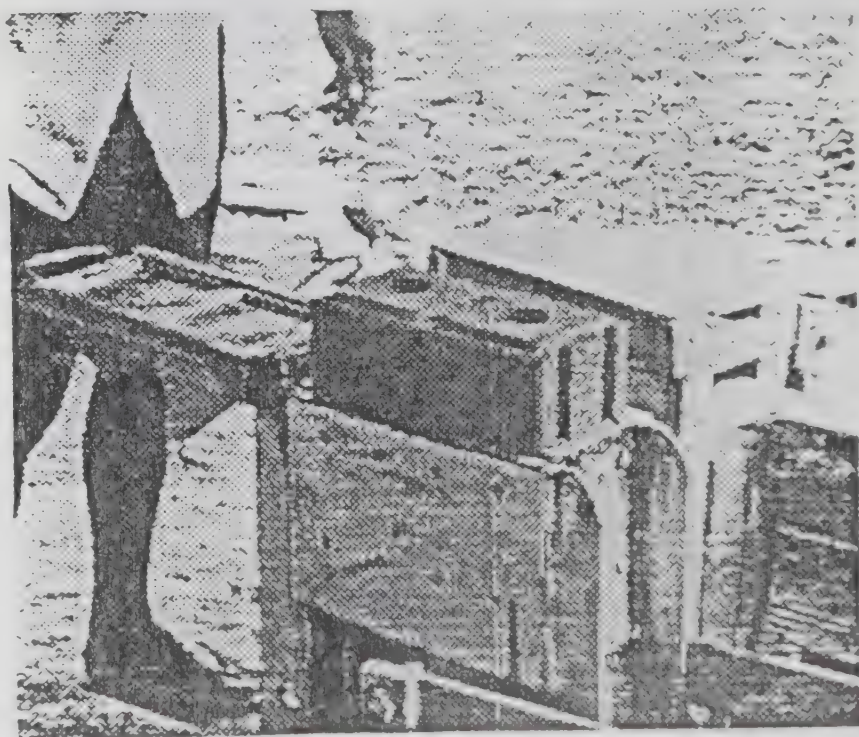
### Interlocking Bricks

Significant success in constructing low cost housing with soil cement bricks has been achieved in various parts of the world where appropriate soils are found. A high quality accurately shaped bricks can be made with Cinva-Ram type moulding machines.

However, the bricks produced by the Cinva-Ram machines, requires mortar joints for placement. While unskilled labor may be used to produce the bricks, some degree of skill is required to place the bricks when building walls. Furthermore, Cinva-Ram bricks are solid and the wall becomes rather massive and oversize for single storey load bearing construction and insufficiently stable for multi-storey construction. In addition, conventional mortar joints allow only light reinforcement to be used making it an unsuitable structural component for use in earthquake zone.

To correct these shortcomings, an interlocking soil cement brick has been developed which can be produced with a modified machine which offers the followings advantages:

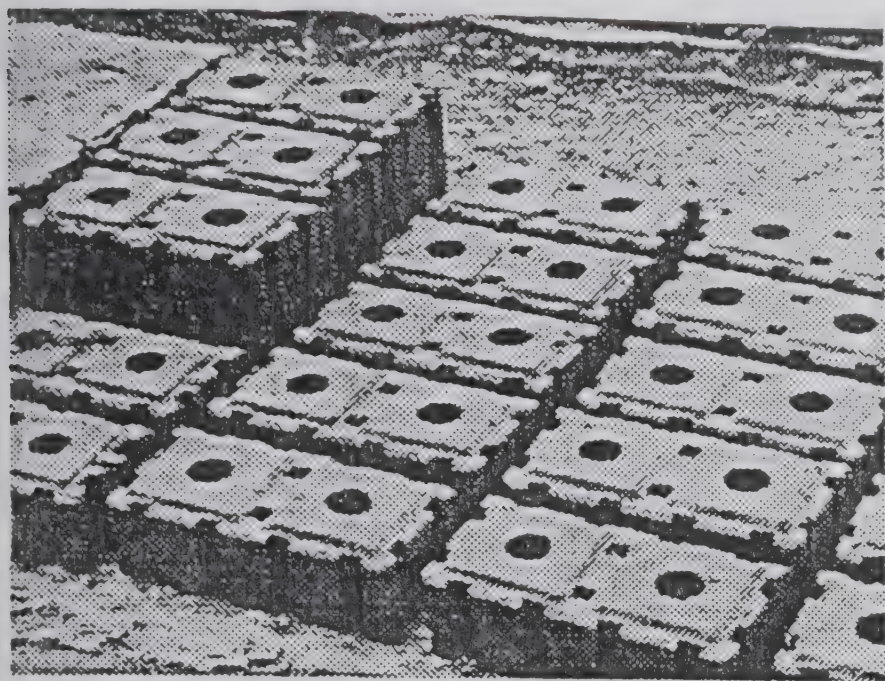
Three types of bricks can be produced with the brick press. Regular, half-size and U-shaped. Soil bricks stabilized with cement and made with good quality soil have a wet compressive strength of up to 40 kg/cm<sup>2</sup>.



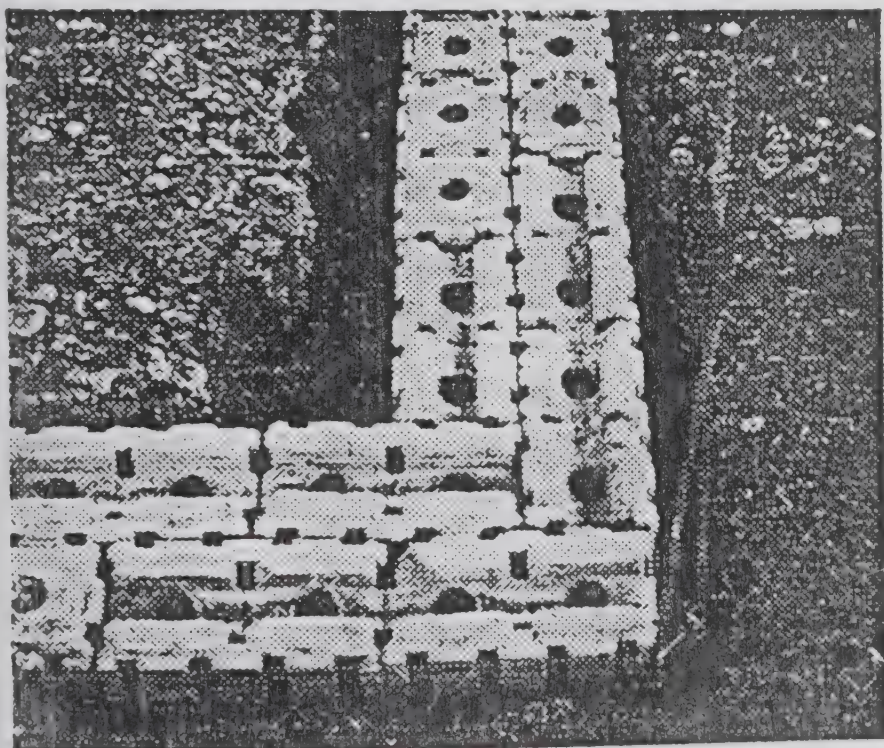




i) **Interlocking Capability** - By introducing positive and negative elements on the top and bottom surfaces, bricks can be laid dry and are automatically aligned when the interlock is completed. Thus unskilled labor may be used for laying interlocking brick at a higher productivity rate than may be achieved with the conventional soil cement brick with mortar joint that are laid by skilled masons.



ii) **Multi-Dimensional Capability** - The length of the new brick is exactly twice its width (15 cm. wide x by 30 cm long x 10 cm. high) so that the right angle corner can be achieved without special corner bricks. This capability may be used for T intersections as well as cross intersections making possible such configurations as buttresses and solid and hollow columns (which may be filled with reinforced concrete) for multi-storey and earthquake reinforced construction.



iii) **Permanent Bond Capability** - In lieu of mortar joints the interlocking brick uses vertical grout holes to achieve a permanent bond. The grout holes are formed by grooves present on all faces of the bricks. These grooves also serve to lock in place other elements of the building system such as doors and window frames using the same grout mixture. The amount of

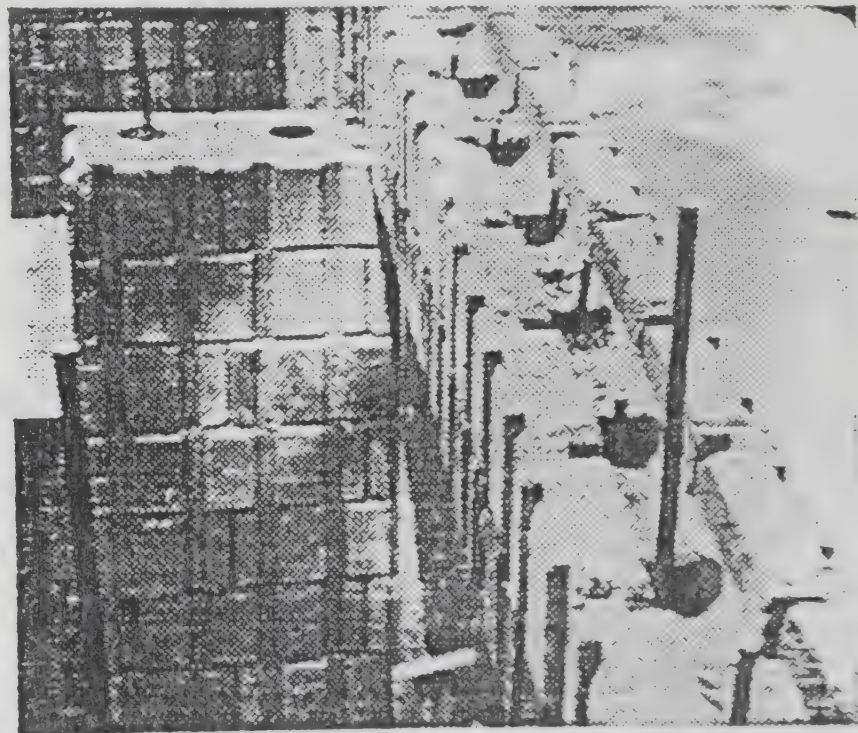
grout used is calculated to be only 7.5% of the mortar used for conventionally laid brick masonry. The grout mix is poured at regular height intervals during the construction of the walls.

iv) **Heavy Wind and Earthquake Zone Capability** - The two circular holes in the bricks permit vertical reinforcement using bamboo or steel at 15 cm. minimum intervals if necessary.



Linkage between vertical and horizontal reinforcement is permitted with the U-shape brick. The U-shape bricks permit horizontal reinforcement at a minimum of 10 cm. interval if necessary.

v) **Multi-Storey Construction Capability** - Since the interlocking brick may be laid at right angles to each other it is feasible to construct walls of multi-brick thickness (wythes)



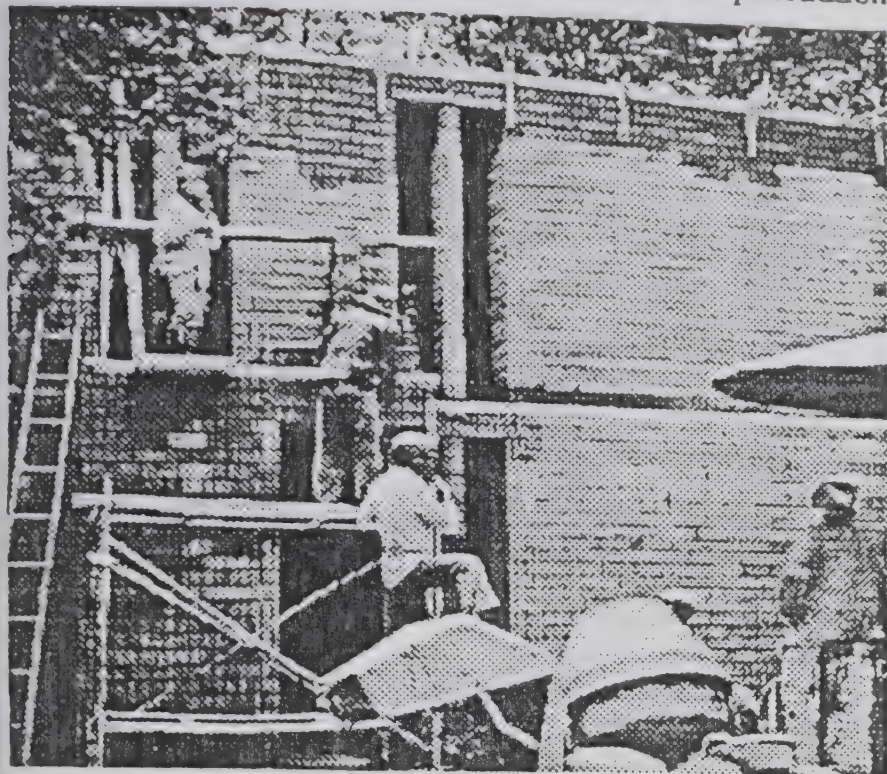
and to place periodic courses at right angles (headers), to the longitudinally laid brick courses (stretchers) laid in overlapping (running bond) manner. In fact any conventional brick laying pattern may be duplicated with the interlocking brick while still maintaining continuous vertical grout and reinforcing holes throughout the height of the wall. Providing that unit





stress loads for soil cement bricks are not exceeded it is possible to erect multi-storey soil cement structures up to five or six storeys by using combination of headers and stretchers.

vi) **Weather Tight Capability** - In spite of the fact that no mortar is used to join the bricks together water cannot penetrate the joints of the interlocking bricks. Water and air penetration



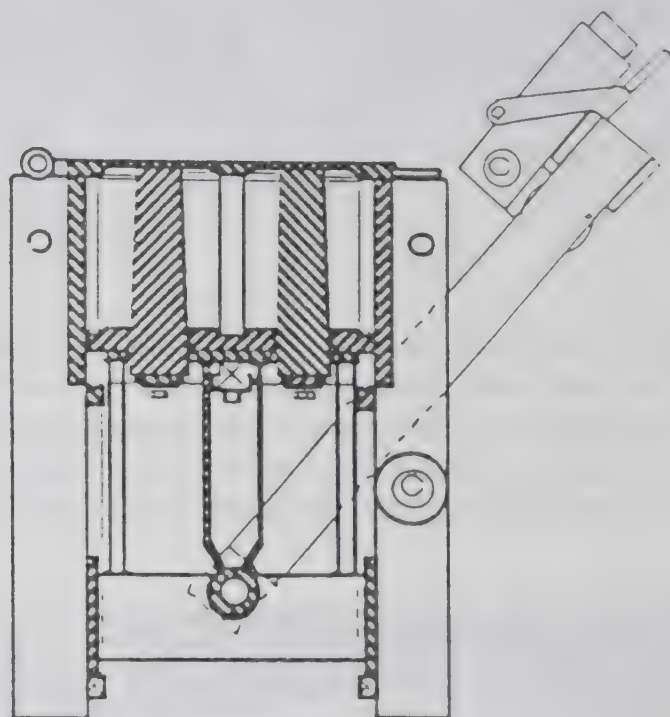
are prevented from passing through the horizontal joints by the interlocking elements and through the vertical joints by filling the grout holes which run continuously through every vertical joint. Furthermore the joints are self-draining if the bricks are laid with the positive interlocking element on the upper surface.

## 2.2 SMALL SCALE BUILDING MATERIAL INDUSTRY

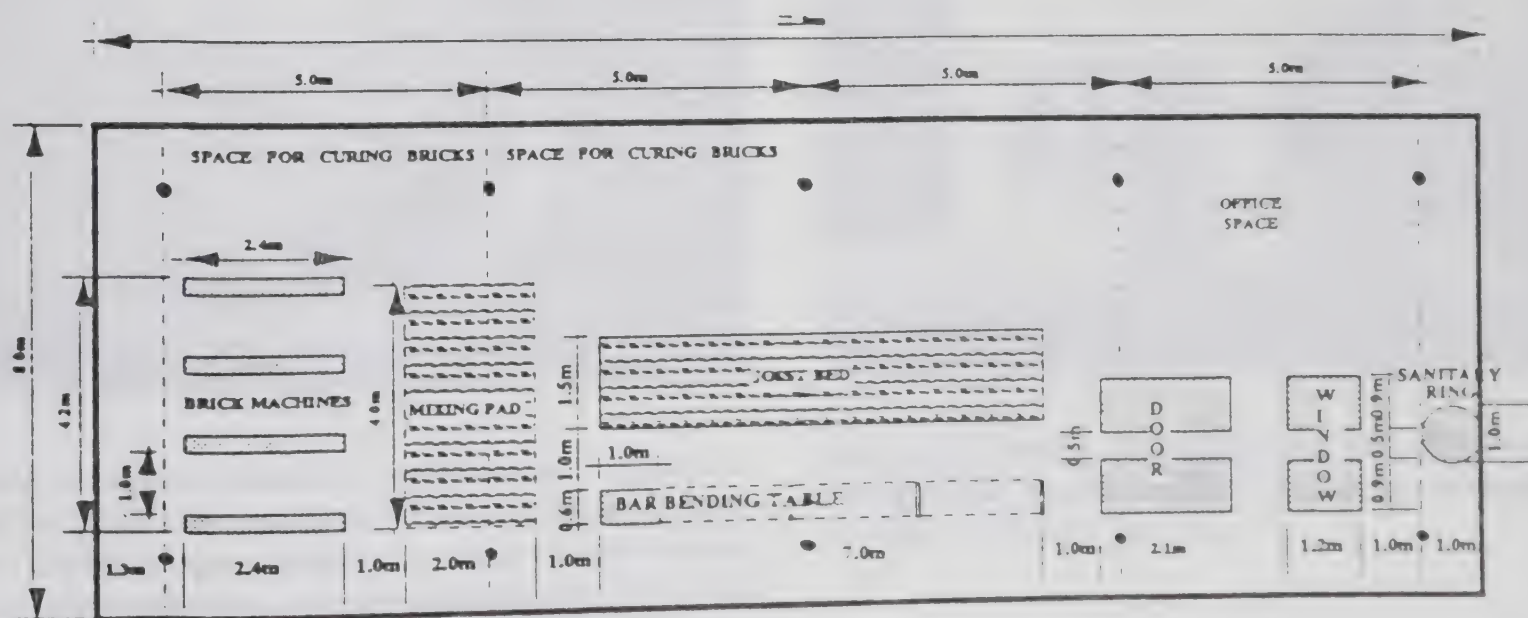
The components of the SCHDS system can be arranged into a small scale building material industry. Different configurations can be assembled depending on the housing demand and

supply requirement of the project or area. A basic SCHDS system could include the following:

Interlocking brick presses (4 presses). The brick presses are manual presses made of steel. Each press can produce 3 different type of brick: regular bricks, half-bricks and U-shaped bricks. The interlocking (no mortar) bricks can be made of crush stone/ sand with cement or stabilized earth with cement. Approximately 200-400 bricks can be made daily with a hand press depending on the type of material used and its availability close to the production units. The dimensions (10 cm high x 15 cm wide x 30 cm long) of the bricks are modularly coordinated with the other components of the building system. Two persons are required to operate one press efficiently.



Section



SELF-CONTAINED HOUSING DELIVERY SYSTEM INDUSTRY LAYOUT

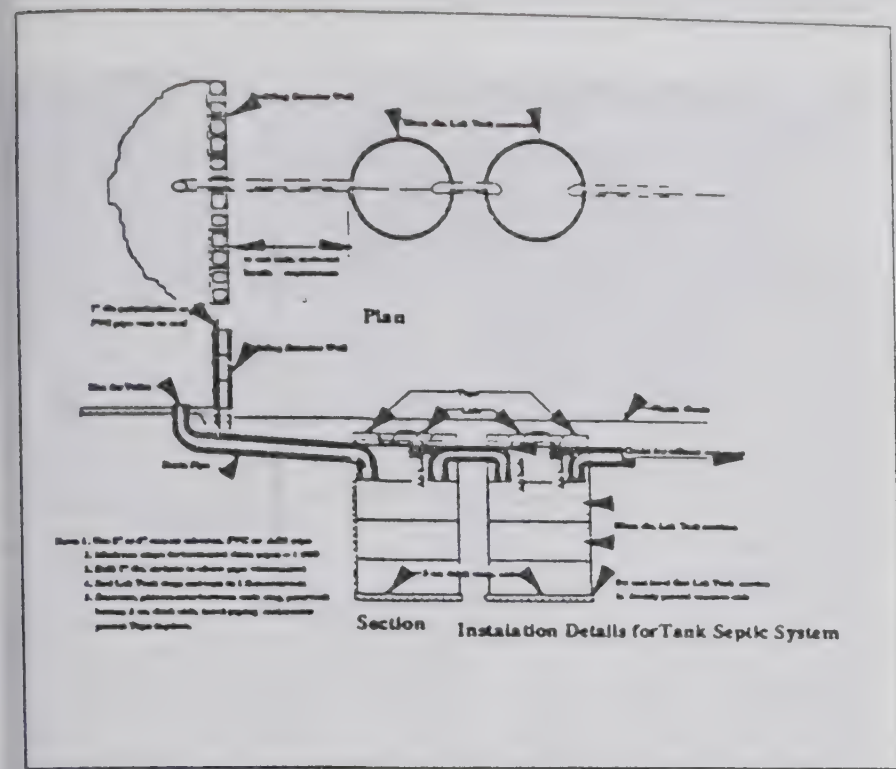
HABITECH PARK



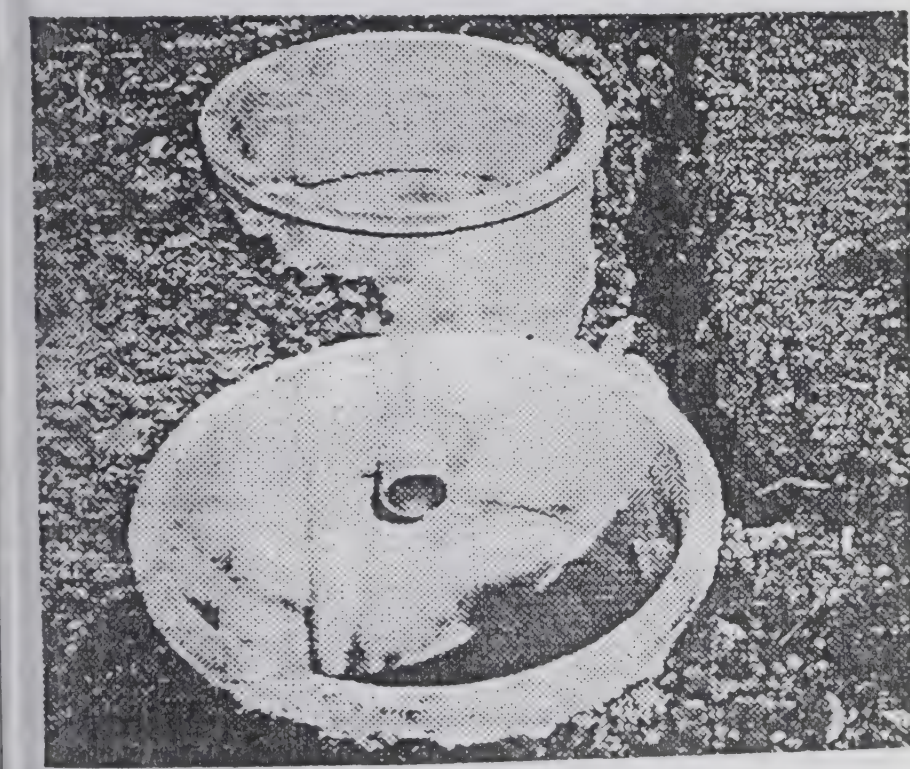




**Sanitary system (1 mould).** The sanitation system used by Habitech Park in projects is based on a double vault aqua privy system. It basically consist of moulds that produce interlocking concrete rings and covers that can be assembled into two connecting chambers.



This system is widely used in many countries and provides a safe and economical method for providing sanitary facilities to households where sewerage infrastructure is non existent. In urban situations, the sanitary system can be later connected to conventional sewerage systems when they are installed in the area.

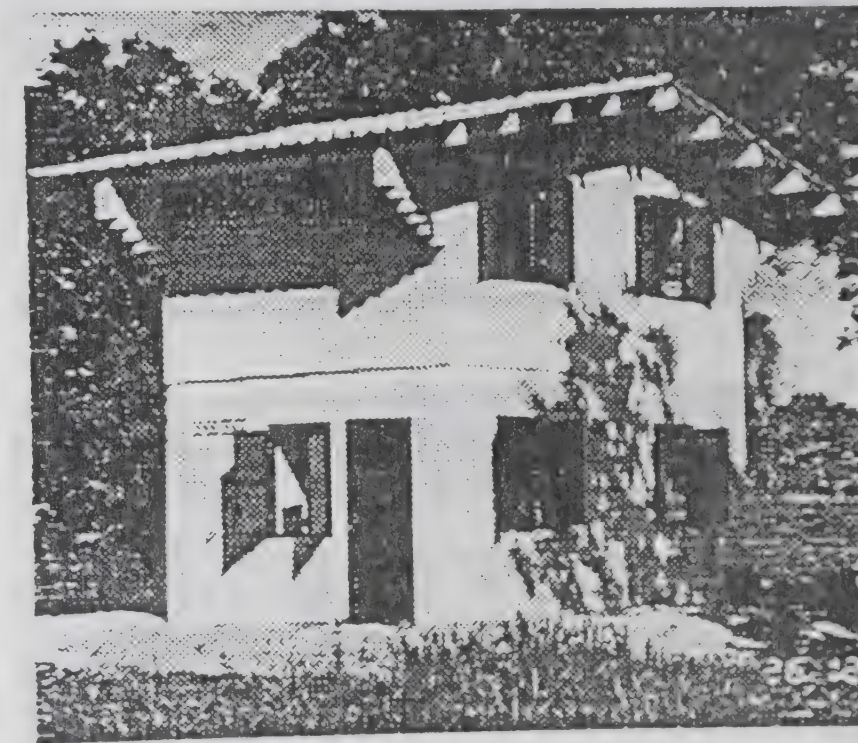


**Ancillary equipment.** If ancillary equipment and tools are not available Habitech Park can provide those necessary for production of the building components. Ancillary equipment can include mixing equipment, sieving equipment, quality control equipment for testing the production of the industry.

With a basic Self-Contained Housing Delivery System one house (40 sq.m - 2 storeys ) a week can be produced(see photograph below) by a team of 20 persons working on a full time basis (800 person hours). The total person hours necessary to build the house is also 800 person hours. In a housing project, a short period after initiation a house a week could be produced employing 20 to 30 persons on a permanent basis in the labours of production and construction.



The notion of constructing economical, permanent, quickly erected housing assumes even more significance now that the proposed basic house strategy is particularly suited to fulfil this need since individual families or community groups, as well as the private informal and formal sector housing industries,



can quickly learn to build a superior type of housing at a cost no more than that required to build the conventional shoddy construction type of housing.

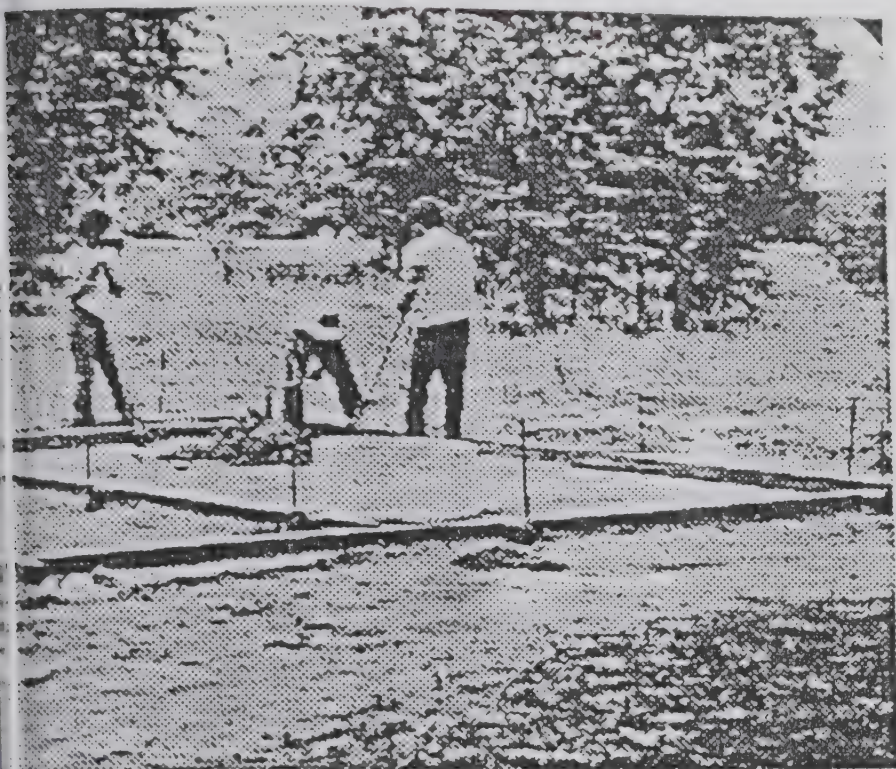




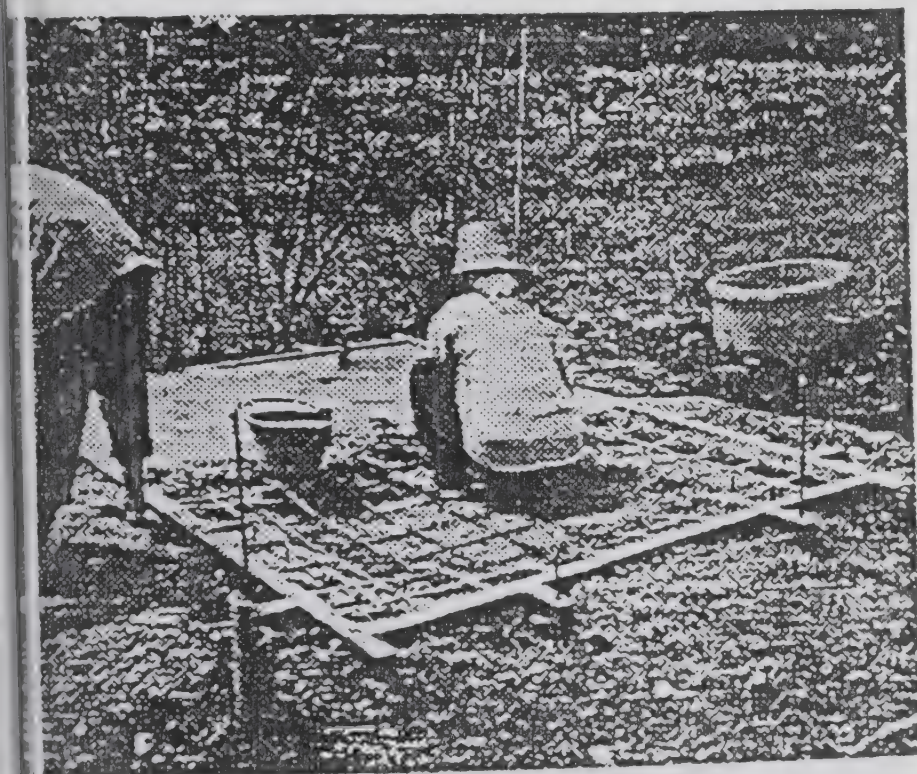


**Foundation Forms (1 mould)** Is a steel form that is used to cast the foundations of the building. It is reusable and permits to construct foundations quickly and accurately without having to stake out the building.

The forms can be adjusted to different modular dimensions

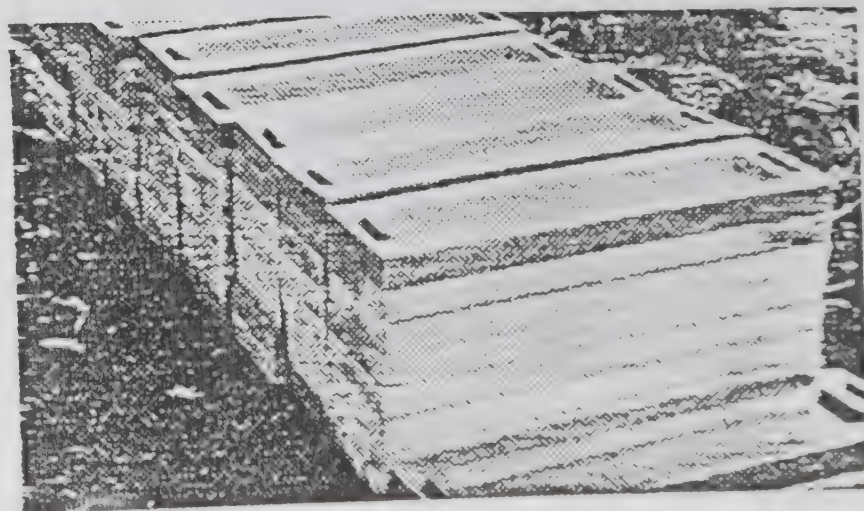
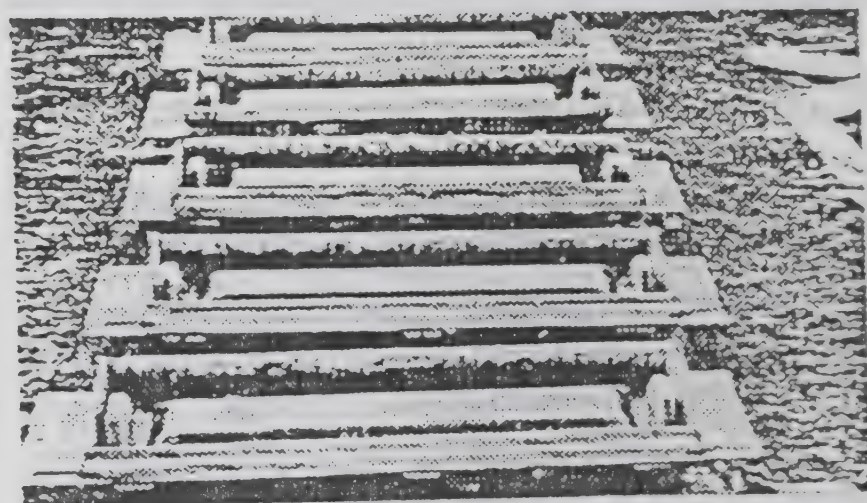


(for example it can vary between 3x3 metres to 6x8 metres. Only one mould is needed per project site.



Reinforcement bars are put in place and the foundation can be poured making the floor surface at the same time.

**Stairs (1 stringer and 2 treads moulds).** These are reinforced concrete stairs free standing with stringers and treads. Different basic stairs configurations can be achieved and adapted to housing and community buildings such as schools and dispensaries.





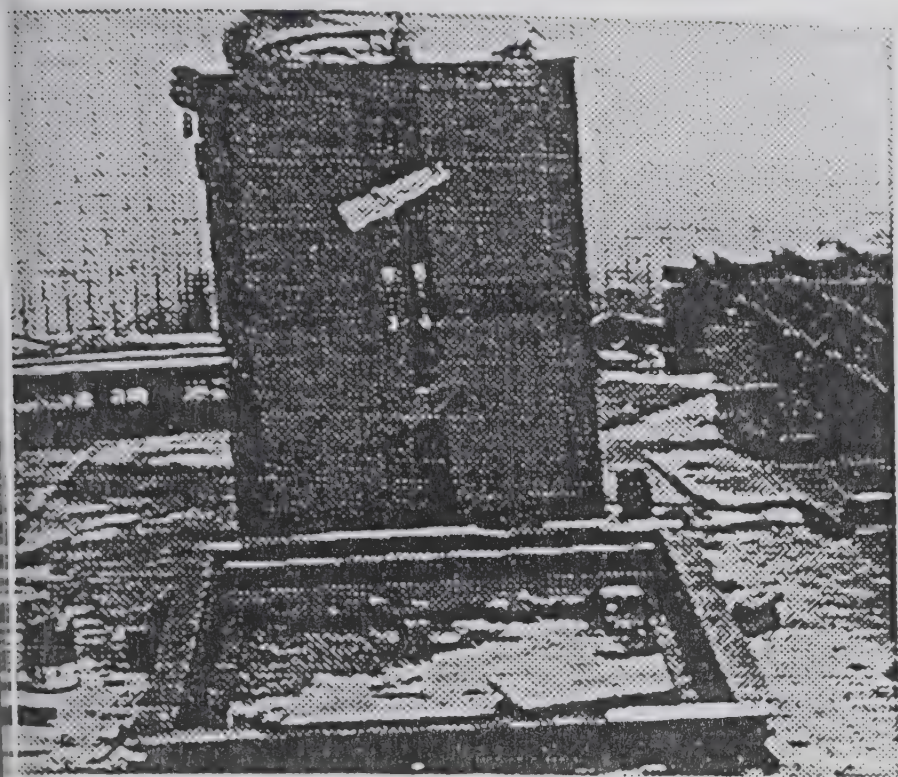




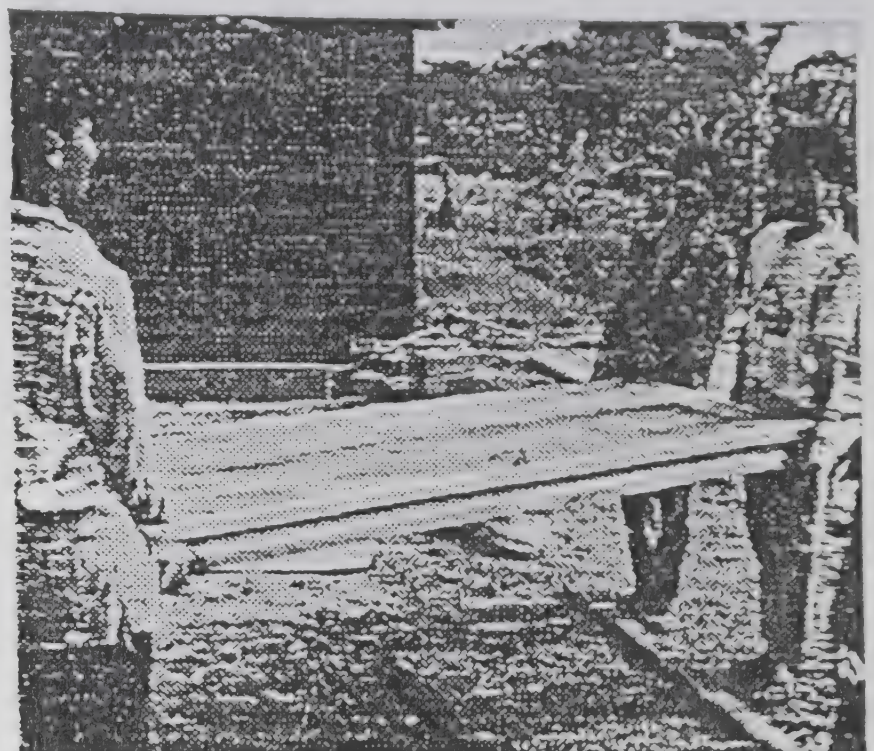
Door (1 mould) and Window (2 moulds) These permit to prefabricate door and window frames in concrete with wooden door or window shutters.

No more than four persons are required to carry the assembled units.

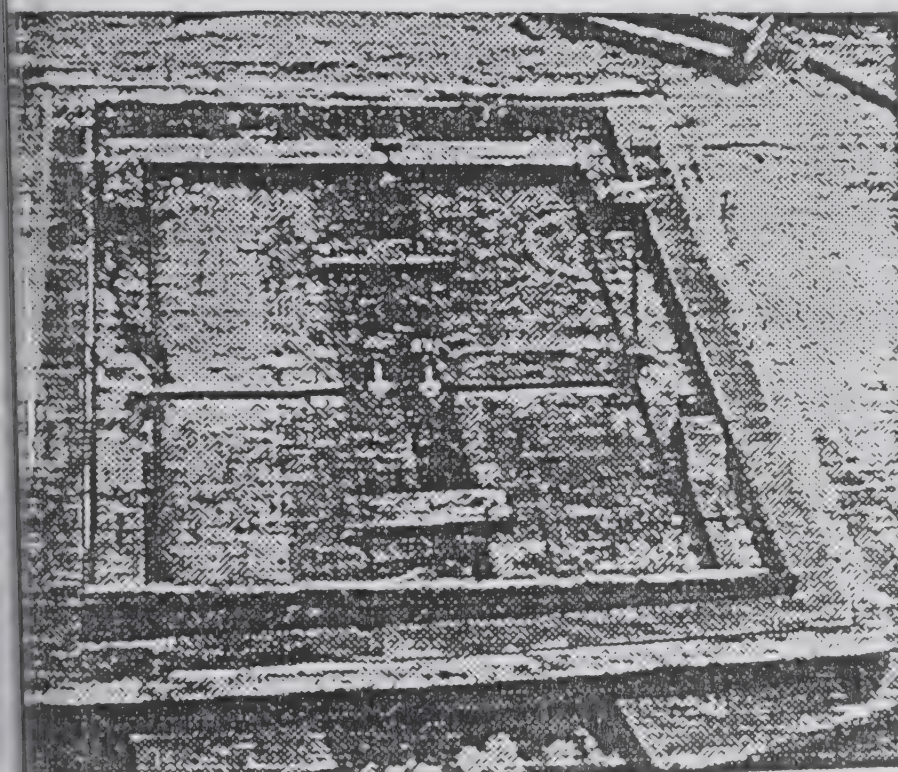
The installation of the modular pre-assembled door or window



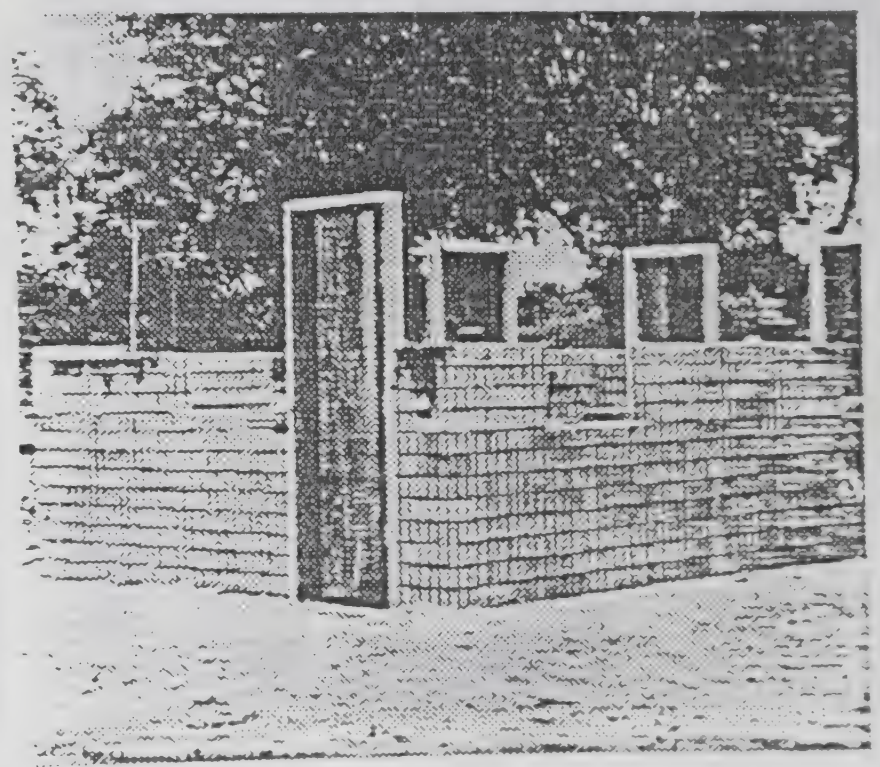
The door mould accepts standard door panels of 80 x 200 cm.



into the wall construction is easy and takes only 15 minutes. Grout is poured into the corresponding grooves of the door or window frames and the bricks securing the panels in place.



The window moulds are fixed or adjustable to the different size of shutters found in the local market.





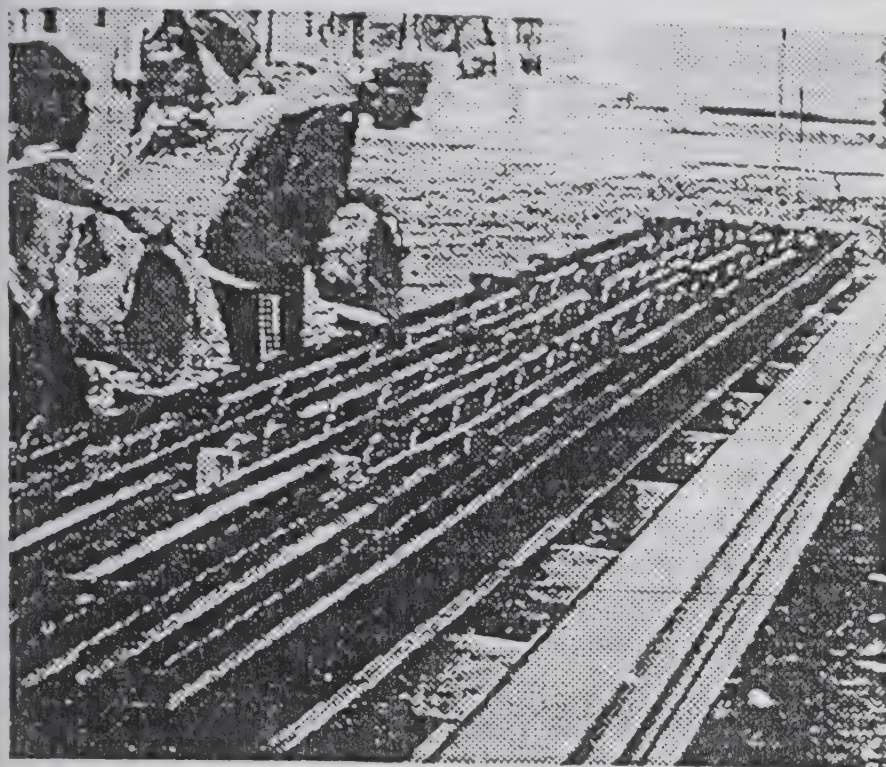




Joists moulds (6 moulds). These consists of a casting bed of six joists. With one bed, six joists can be cast every day.

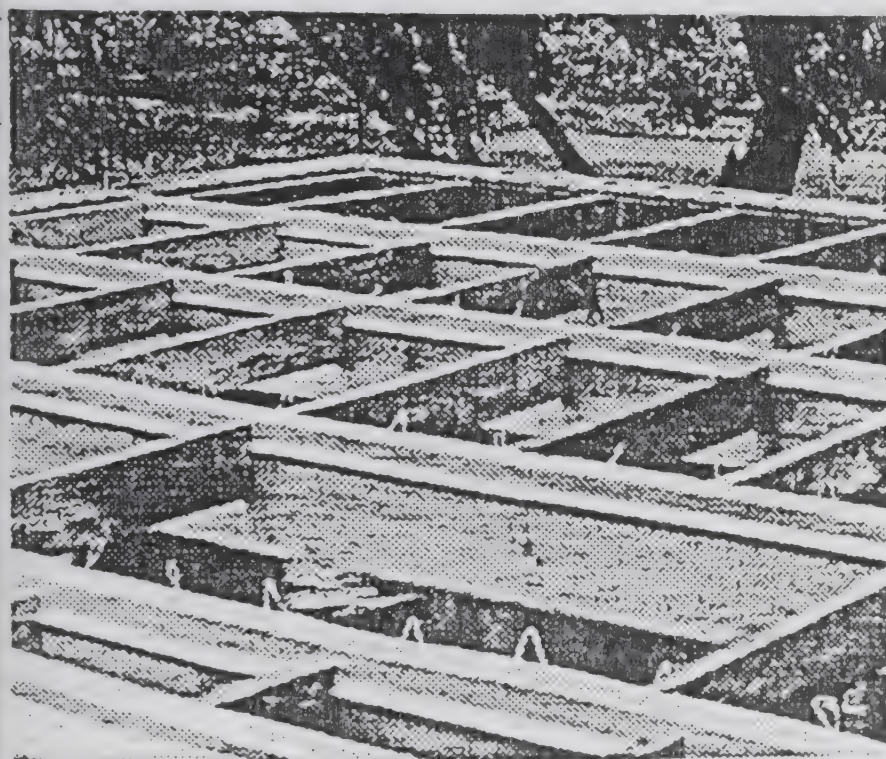
The maximum span for the joists is 5.10 metres ( depth of 200 mm reinforced with one 6 mm rebar top and two 2 mm rebars bottom and 2 mm tie wire shear ).

The joists can have a maximum length of 7 metres with the



possibility of a one metre overhang on each side of the span.

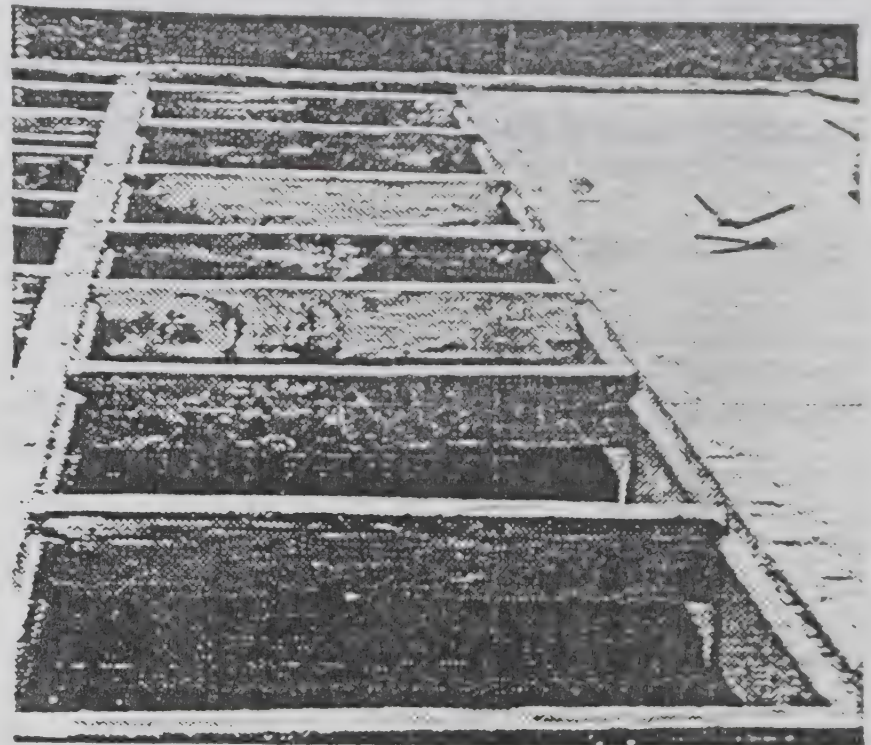
The joists spacing is 600 mm to 900 mm (2000kg/m<sup>2</sup> to 640kg/



m<sup>2</sup>) depending on load and usage. These joists can be used to construct floor and roof structures.

The floor consist of reinforced concrete 140 mm thick with reinforcement 6 mm rebars at 15 cm perpendicular to the joists which is cast in place over form work supported by the joists during casting.

The floor structural design is basically a "T" section where the



top of the T consist of the floor which is cast after to form the T section with the joists.

The form work used for casting the floor can be reused over and



over because of the joists design.





### 3 CURRENT OPERATIONS

#### 3.1 TEACHING AND LABORATORY ACTIVITIES

Teaching, training, research and development activities take place at Habitech Park Facilities.

##### Courses

Habitech Park provides laboratory facilities for the Human Settlements Development Division courses and workshops which relate to the Land and Housing Specialization. Habitech Park also offers and conducts short courses for groups where special housing problems are analyzed and solutions developed in a workshop / studio environment.

The courses that make use of Habitech Park Facilities are mainly HS-07 Design of Human Settlements where the design of low cost housing are being elaborated in workshops by graduate students, HS-08 Human Settlements Construction Technology and HS-98 Housing Project Implementation. Students taking these courses often interact with community groups and practitioners in housing projects that are being planned or implemented in different countries of the region.

Habitech also provides testing and support facilities where construction components for low cost housing can be developed and tested as part of research projects.

##### Trainings

i) Training sessions in production, construction and management of small scale building material industries using the building system are carried out at Habitech Park Facilities for groups. These groups originate from community organizations, NGOs and institutions involved in housing and infrastructure projects.

Training sessions are conducted in a typical Self-Contained Housing Delivery System (SCHDS) industry (160 sq.m) installed at Habitech Park. The typical industry is equipped with all the moulds and equipment of the building system and its configuration permits the production all the construction components required to build a house.

Habitech Park can provide accommodations for trainees and facilitate visas arrangements through the Government Relation Office of AIT. Participants are expected to provide for their daily expenses.

ii) Habitech Park also offers on site training in the use of the construction system when it is not possible for groups to come to AIT. Arrangements for on site training are made on a case by case basis.

#### 3.2 SERVICES

Habitech Park offers the following services to government organizations, NGOs, housing cooperatives, communities and private groups:

i) Architectural and planning services for housing projects including site planning, house design and specifications;

ii) Building material production planning and feasibility studies including marketing, technical and financial analysis related to housing and social infrastructure projects;

iii) Research, design and evaluation of building components, materials and technology;

iv) Construction and supervision of the construction of housing projects using the building system developed at Habitech Park;

v) Supply of complete housing production plant ranging in capacity from one house a week to one house a day;

vi) In addition to supplying moulds and equipment can upgrade or expand existing equipment and moulds, inform users of new technological developments and supply spare parts and special repairs upon request;

vii) Supply shop drawings to fabricate all the moulds and equipment of the Self-Contained Housing Delivery System to be assembled locally in machine shops.

##### Equipment Production

Habitech Park is also equipped to fabricate and assemble all the moulds and equipment of the Self-Contained Housing Delivery System. A group of technicians and workers are employed in the fabrication of the systems for projects. Systems assembled at Habitech Park have been delivered to countries in Asia, Africa and Latin America.

#### 3.3 RESEARCH AND DEVELOPMENT

Habitech Park activities in research and development have been carried out with the aid of research grants and with the collaboration of the public and private sectors of Thailand and of other countries of the region. Research and development projects have consisted of the following:

##### GRANTS

i) High Strength Interlocking Concrete Blocks.(On-going)(Sponsors: CUC-AIT-PP Demonstration Research Fund. The research is concerned with the development of hydraulically operated presses for producing concrete interlocking blocks to address larger projects and build multi-storeys housing units.



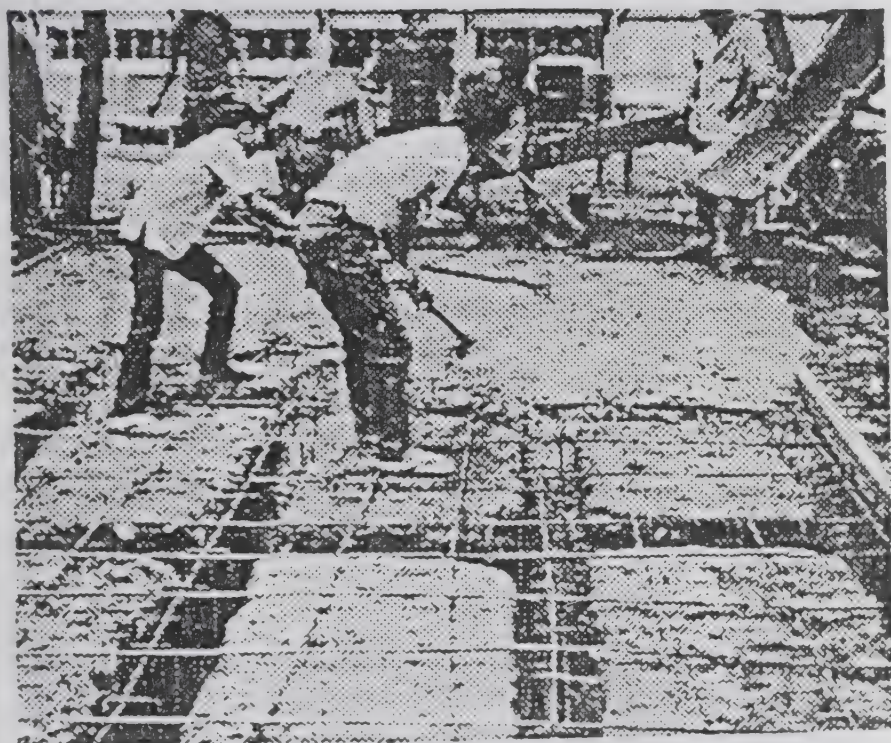




ii) **Housing Through Small Scale Building Component Industries** (on-going) Sponsor: CUC-AIT-PP Demonstration Research Fund. The research is concerned with the feasibility of establishing community building industries to provide local employment and reduce the cost of housing for the poor communities of Asia. The research is conducted through the study of completed and on-going SCHDS installations to determine which configurations are the most effective and to improve the transfer of the technology.

iii) **Pre-Stressed Joists** (on-going) Sponsor: CUC-AIT-PP Demonstration Research Fund. This research is concerned with the feasibility of fabricating joists using pre-stressed steel wires instead of standard steel reinforcement bars. Joist in the building system have so far only been produced using standard bars. In long spans (over 4 metres) if pre-stressed steel wires were used production cost could be reduced and the strength of the joist could be increased making possible greater spans with the same cross section.

iv) **Floating foundation** (completed) Sponsor: CUC-AIT-PP Demonstration Research Fund. The research demonstrated basic urban housing units using a floating foundation instead of piles in delta regions where ground resistance is low. A demonstration house was built at Habitech Park following the



National Housing Authority of Thailand standards for housing and is being monitored for differential settlement.

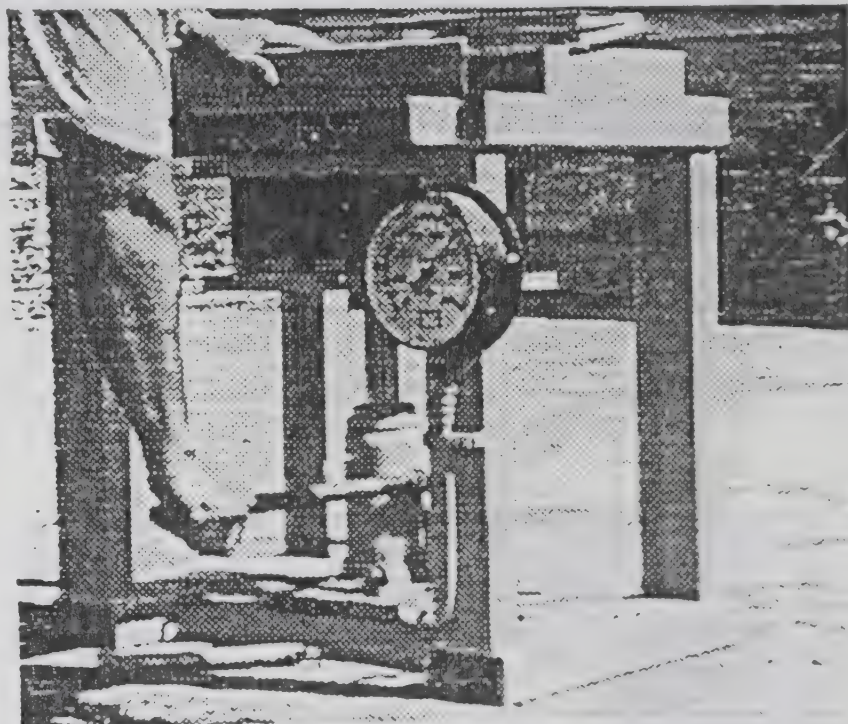
v) **Training Center** (completed) Sponsor: CUC Research Grant. To disseminate the construction technology a training center was built at Habitech Park. Training programs in production, construction and management are carried out in this center to ensure that proper transfer is made in the use of the construction system. The prototype industry set up also serves

to test different equipment installations and configurations. The prototype is model to be reproduced in the field by the different trained groups.

vi) **Symposium on affordable housing in Asia** (on-going) Sponsor: CUC-AIT-PP Demonstration Research Fund. The symposium is intended to explore alternative solutions for housing lower income groups in Asia through the construction of full-scale relevant prototypes at Habitech Park. The host and organizer for the Symposium is Habitech Park which will arrange the logistics for the construction of the prototype houses and conduct the symposium.

vii) **Field testing kit** (on going). Sponsors: CUC-AIT-PP Demonstration Research Fund. Soils used for making bricks need to be tested in order to produce good quality bricks. Testing must be done first to find the proportions of sand / clay silt content of the soil and to find its resistance when mixed with cement.

Apparatus for carrying these tests are usually found in soil laboratories which are often inaccessible to small producers. In order for small scale producers to be able to test their products, the research project intends to develop simplified versions of all the equipment necessary to carry tests in the



field. This would guarantee proper production of soil-cement bricks.

Equipment will be developed and tested for accuracy by comparing results with laboratory equipment to ensure that the results obtained are valid. The equipment will be made from locally available materials and parts.



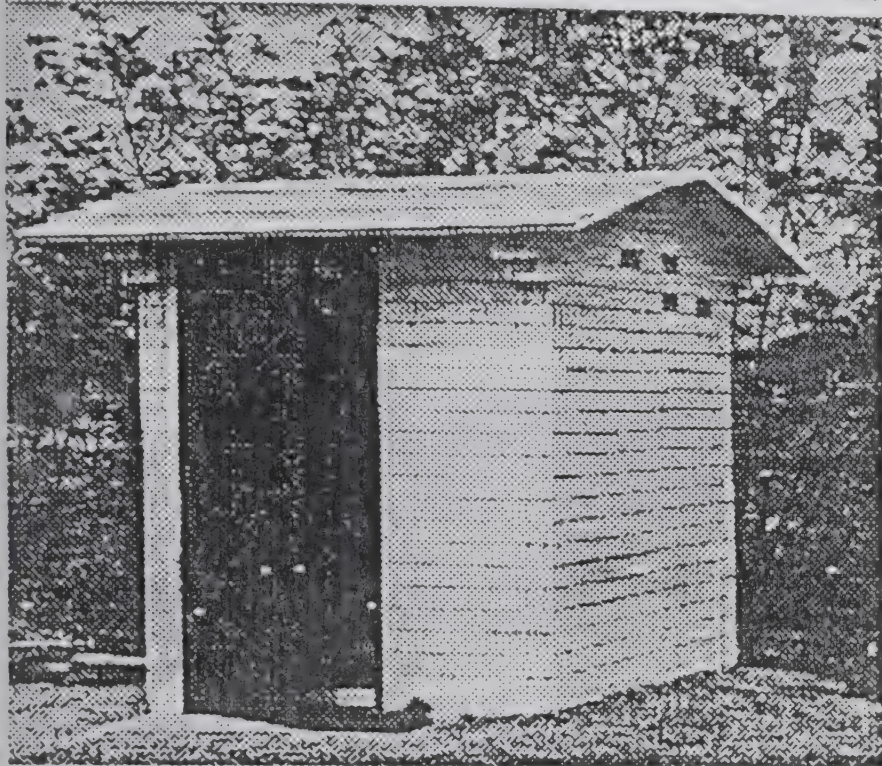




## DEMONSTRATIONS, HOUSING, SOCIAL INFRASTRUCTURE

### LOCAL PROJECTS (Thailand)

i) **Rural Sanitation (on-going)** Sponsors: Canadian Embassy Mission Administered Fund. The sanitation Project is a joint project of Habitech Park and NGOs in Thailand, Vietnam and Cambodia. To implement this project Habitech Park Facility provides construction systems that will be used to fabricate all the construction components required for erecting the sanitary installations. Participants are recruited from the NGOs and the communities involved and trained at Habitech Park in the



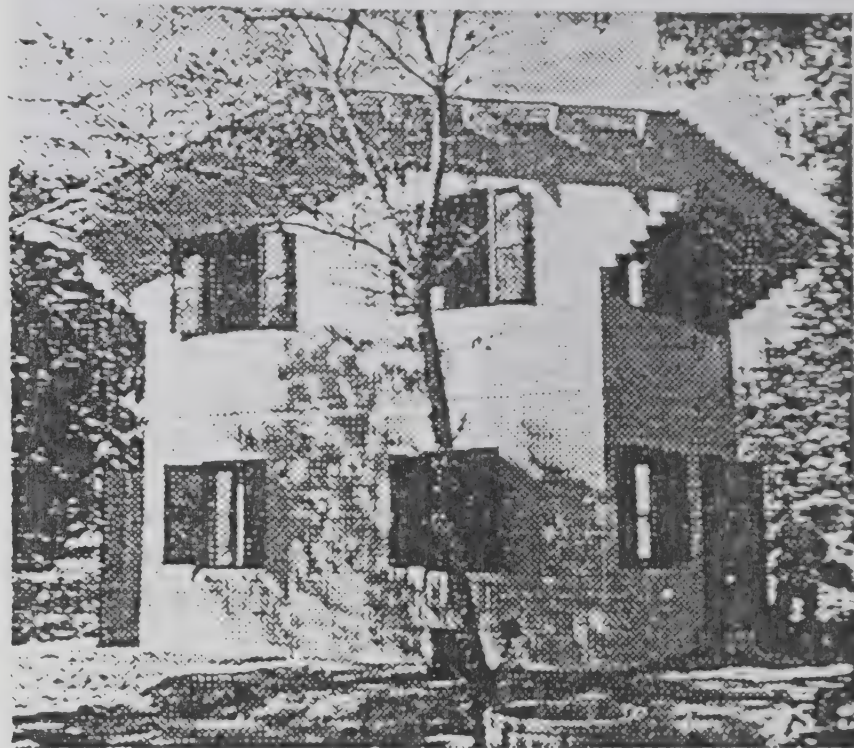
manufacture and assembly of building components required to construct the modular sanitary installations. Upon completion of their training, the trainees return to their respective areas to become trainers, organizers and implementers of rural sanitation programs.

ii) **Singburi Housing Project - Singburi Province (completed).** Sponsor: Provincial Government of Singburi. The

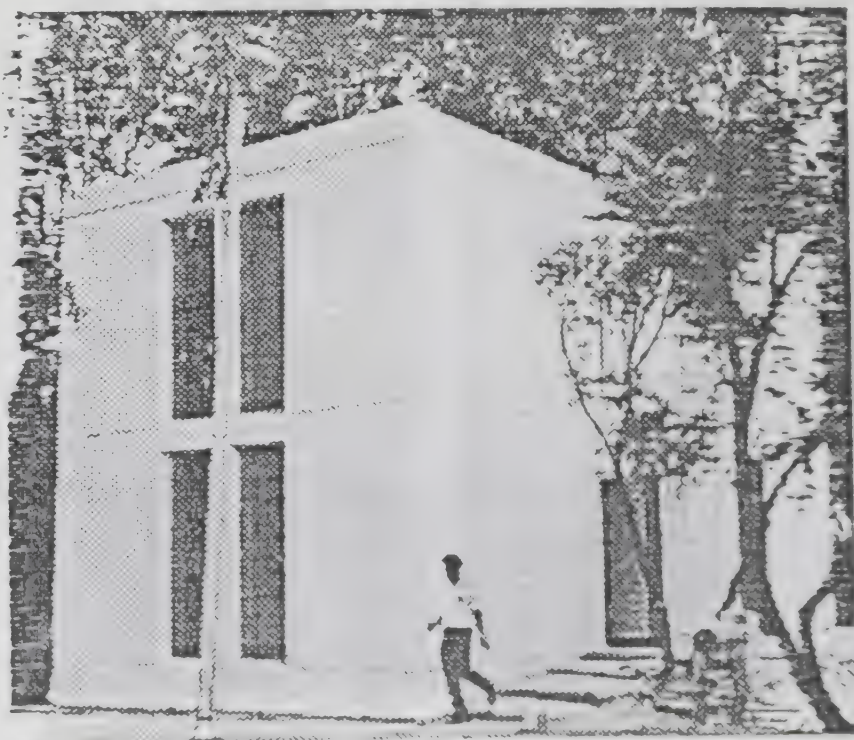


project involves the building of houses for government employees. This project illustrates very well the effects of a demonstration house which was built earlier. Low income employees of the Provincial Government were trained in producing the building components and in construction using mutual help. They are producing on a part time basis all the components required and up to now six houses have been built.

iii) **Core house Demonstration Project - Habitech Park (completed)** Sponsors: CUC-AIT-PP Demonstration Fund. The project was carried out to demonstrate to the National



Housing Authority of Thailand a basic low cost housing unit for resettlements projects in Bangkok through the use of the building system and special foundations. The house is meant to be built in two stages: first as a core house (ground floor) and then expanded to a second floor. The house was built on Habitech Park and has an total area of 40 sq.m. with a cost of 3,000.S including materials and labor.



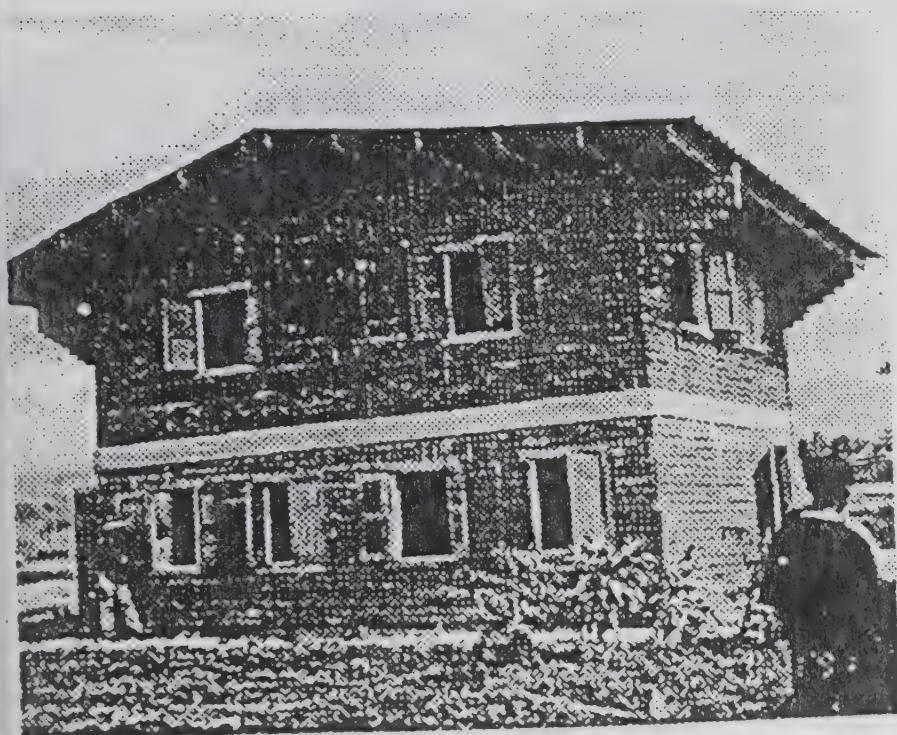






iv) CUC-UH Student and Faculty Guest House- AIT Campus (completed) Sponsors: Canadian Universities Consortium, University of Hawaii, Habitech Park, AIT. The project involved the building of a Guest house to accommodate students and Faculty on AIT Campus as part of the CUC - UH student scholarship and Faculty Secondment Programmes. The house was completed in early September of 1991. The house is a demonstration of affordable housing for middle income families of Asia using the building system developed at Habitech Park. The house has an area of 100 sq.m and its cost was 17,000.S including materials and labor.

v) Wiang Papaor Housing Project - Chiang Rai Province (on-going). Sponsors: Girls Guide Association of Thailand / CIDA. The project involves building houses in a rural community of Thailand. The project is the focus of related research / thesis work by HSD students. A Self-Contained Housing Delivery System is installed on the project site and a demon-

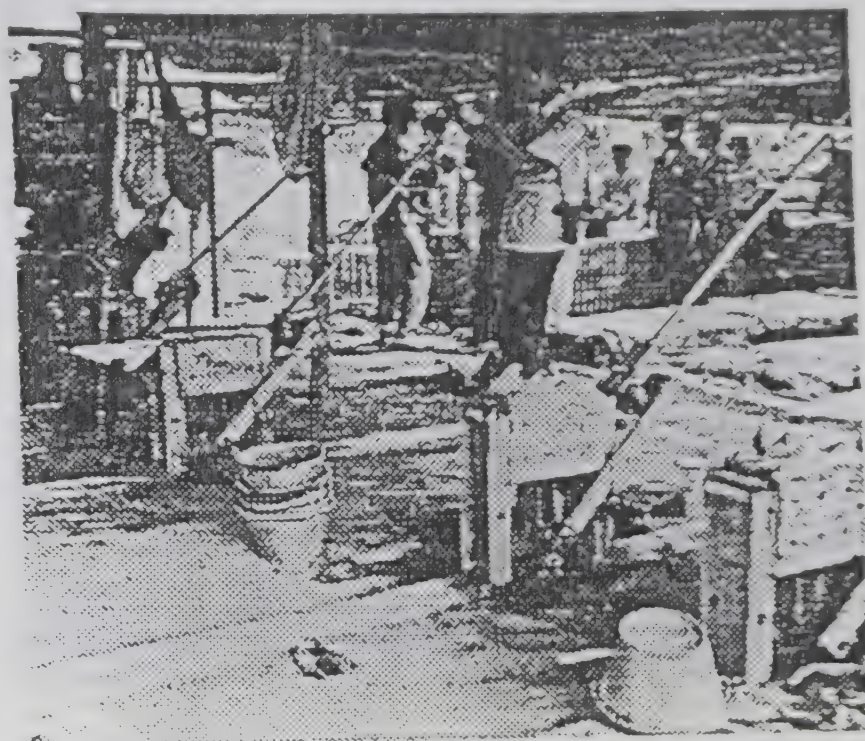


stration unit was built by a group trained at Habitech Park.

vi) Credit Union League of Thailand (CULT) Demonstration Project - Bangkok (completed). Sponsors: Credit Union League of Thailand / CIDA. The project involves demonstrating construction technology to the member institutions of the CULT. Plans were prepared for a demonstration building to be constructed at the CULT main office with funds from CULT and CIDA to demonstrate the technology to the members.

The building under the supervision of Habitech Park was constructed in time for the annual meeting and general assembly of the members of the union. The project involves disseminating the technology through member institutions throughout Thailand. A training in production and construction was held at Habitech Park for a group from CULT. Equipment is being provided to member institutions of the Credit Union of Thailand.

vii) Khao Kho Housing Project - Petchabun Province (on-going). Sponsors: RTA, RFD and UNDP/FAO. The project lies within the framework of a Reforestation Project and involves the construction of three rural villages (approximately 150 houses) in its first stage.



The housing component of the project is managed by the Royal Thai Army. The project is being used as a base for field research for students of HSD.

Habitech Park has been involved in the project from the beginning with the design of housing units, testing of soil samples for producing interlocking bricks and training of groups in production and construction. The design is a two storey 64 sq.m house using soil-cement bricks and the other components of the building system. Three complete SCHD Systems were installed at the construction sites of the villages. The estimated cost of each house is 1,500.S including materials but no labor since it is provided by the villagers.



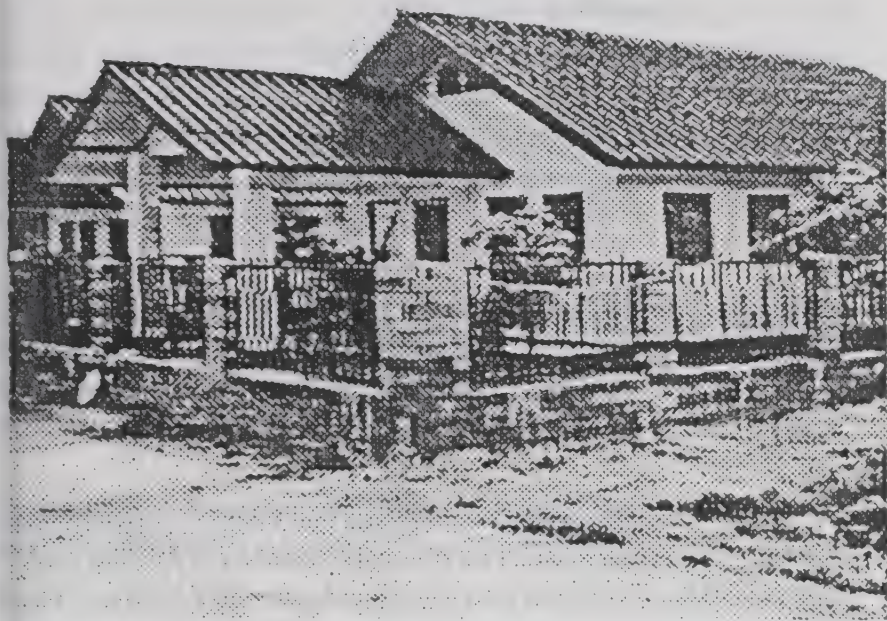






viii) **Bangkok Housing Project** (on-going) Sponsors: Private sector, Bangkok. The project involves building 27 one room apartments to house factory workers. Using a SCHDS system, the project is funded by a private developer in Bangkok. A training in production and construction was held at Habitech Park for a production group.

ix) **Chiang Mai Housing Project** (on-going). Sponsors: Private sector, Chiang Mai. The project involves the construction of middle income houses (72 sq.m) by a small developer in the Amphur of Sansai (Sansai Garden) 6 kms from Chiang Mai. A SCHDS system was transferred to the developer after a training in production and construction at Habitech Park. Ten houses have been completed and were sold on the market for an average price of 20,000.S



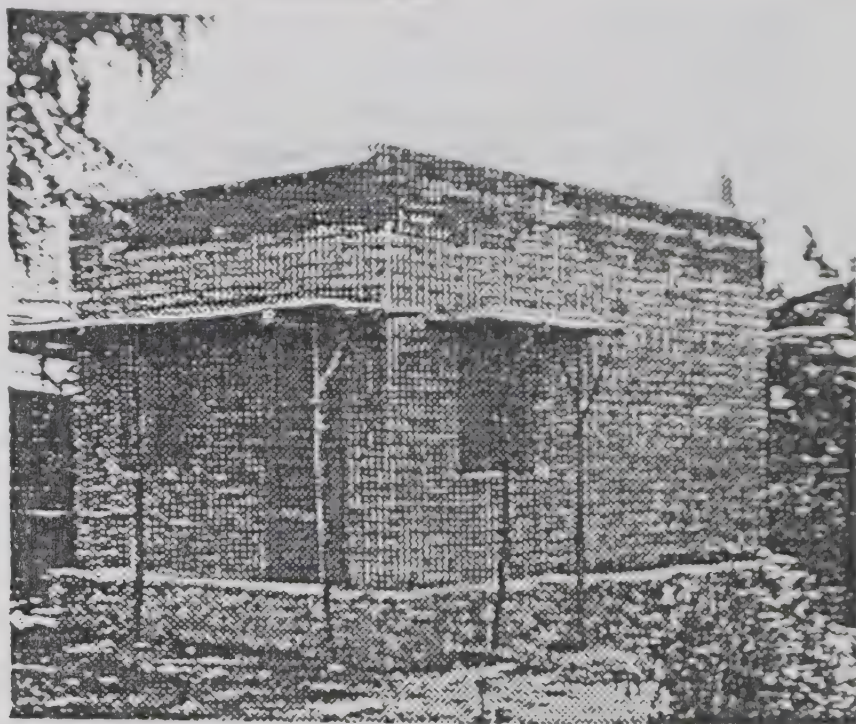
#### INTERNATIONAL PROJECTS

i) **Education for Rural Development in Seti Zone - Western Nepal** (completed) Sponsors: UNDP / UNESCO / UNICEF. Elementary schools project, Western Nepal, United Nations Development Programme, UNESCO / UNICEF with The Ministry of Education and Culture of Nepal. The first phase of the project involved the transfer of technology and the construction of 5 elementary schools comprising three rooms (approx. 80 sq.m.).

The feasibility of using a SCHDS system was assessed and the technology proved to be 50% cheaper than conventional construction technology. The second phase of the project involves constructing 45 more schools using the building system. A training session in production and testing of materials was conducted in the field by Habitech Park staff.

ii) **Quang Binh Housing Project** - Quang Binh Province - Vietnam (on-going) Sponsors: Mennonite Central Committee and CIDA Mission Administered Fund. The project involves the transfer of a SCHDS system to a centrally located region of Vietnam which was destroyed by a typhoon in 1990. The project is managed by the Reconstruction Committee of

Quang Binh. Technicians were trained at Habitech Park in production, construction and management. A pilot house has been designed and built according to local customs. It is being tested and monitored to find out its appropriateness to the weather conditions in the area.



iii) **NGOs Seminar/workshop and manuals for the delivery of housing to poor communities in Asia** (on-going). Sponsor: Asean Canada Centre, Singapore. The project involves the transfer of technology developed at Habitech Park through housing workshops, seminars and manuals which will be made available to NGOs in three Asean countries.

iv) **ILO Inter-Regional Project "DECO"** (Starting). Sponsor: International Labour Organization-Geneva and the Swiss Government. The project involves promoting small scale entrepreneurship in building material production for housing in Thailand, Vietnam, Cambodia and Laos. Habitech Park will be the executing agency of the project with activities related to technical assistance, quality control, credit and marketing extended to small scale enterprises.

v) **Future projects.** Currently three more projects are under preparation:

**Sri Lanka Housing Project- Colombo.** Sponsors: Darmavijaya Foundation / Ministry of Housing. This project involves the feasibility of transferring SCHDS systems to urban and rural communities involved in the Million Houses Programmes of Sri Lanka. The project is funded by the Darmavijaya Foundation and the Ministry of Housing and Construction. A 100 houses pilot project in Colombo is planned by the Ministry of Housing to be executed by the Center for Housing, Planning and Building (CHPB). Officers from CHPB have studied the technology and recommended the pilot project. The Darmavijaya Foundation will carry out the rural project.







**Nepal Housing Project.** Sponsors: International Center for Integrated Mountain Development (ICIMOD) / UNDP. This project involves the transfer of SCHDS to ICIMOD and mountain communities in Nepal to implement housing projects. The project is being funded by UNDP and ICIMOD.

**New Caledonia Housing Project.** Sponsors: La Chambre des Métiers de Nouvelle Calédonie. This project involves the use of laterite extracted in mining processes in N.C. to build low cost housing for indigenous communities of the Island.

## LINKAGES

### 4.1 REGIONAL LINKAGES

i) **Samahang Bagong Buhay (SBB)**, Philippines, a non-profit, non-governmental organization providing low cost housing to low income families throughout the Philippines has been solely supported by Habitech Park from 1986 to the present. SBB carries on a continuing research program into low cost housing technology in cooperation with Habitech Park.

ii) **Capiz Foundation**, Philippines, a non-government organization that is engaged in a massive Province wide reconstruction following devastating typhoon damage is supported by Habitech through joint housing research and development.

iii) **Thailand Institute of Scientific and Technological Research (TISTR)** Habitech Park is working in close cooperation with TISTR especially in soil cement based building components. TISTR has made available to numerous governmental institutions in Thailand the technology developed at Habitech Park. The presses to produce interlocking bricks are now widely used in housing and infrastructure construction throughout Thailand. TISTR also carries out tests for soil suitability and different mixes and provides instructional training on site.

iv) **King Monkut Institute of Technology (KMIT)** Habitech Park is working in collaboration with the KMIT and the private sector (building material production) to develop high strength concrete interlocking blocks.

v) **Building Together Association (BTA)**. Habitech Park is involved in community housing projects in the Bangkok Metropolitan Area with the Building Together Association. BTA promotes housing cooperatives in Thailand. BTA and Habitech Park are collaborating in the planning and implementation of housing projects with three cooperatives.

vi) **Canadian Cooperative Association (CCA)**. The Canadian Cooperative Association is an NGO involved in the sanitation projects with the Center for Agricultural Extension Volunter (CAEV) of Vietnam. Sanitation systems are being

delivered to Vietnam through CCA activities. Trainings will be held for extension workers of CAEV.

### 4.2 INTERNATIONAL LINKAGES

i) **School of Architecture, University of Hawaii, USA.** Through the Development Studies Program of the School, Habitech supports research in housing. A Study Abroad Agreement has been formally accepted where graduate students from the School of Architecture and the Department of Urban and Regional Planning of the University of Hawaii at Manoa will come to AIT to do research in an Asia.

ii) **University of British Columbia, University of Calgary, University of Waterloo and the University of York of the Canadian University Consortium Partnership Project (CUC-AIT-PP).** Habitech Park supports research in housing through scholarship students of the CUC-PP. Two students from each university of the consortium come to AIT every year to do research in Asia as part of the CUC-AIT-PP.

iii) **School of Architecture of Mc Gill University.** Through the Minimum Cost Housing Center.

iv) **Hanoi Institute of Architecture (HAI).** HAI and Habitech Park have been collaborating in the dissemination of the technology developed at Habitech Park in Vietnam.

vi) **Center for Housing, Planning and Building of the Ministry of Housing and Construction of Sri Lanka.** In a joint project, the feasibility of disseminating the technology developed at Habitech Park will be assessed through urban and rural housing pilot projects.

vii) **Regional Network of Research and Training Institutes in Human Settlements** Habitech Park will be part of the RNRTIHS to be created by the Economic and Social Commission for Asia and the Pacific through the Human Settlements Development Division of AIT.

viii) **International Labour Organization (ILO).** Habitech Park is collaborating in executing the DECO Project with the International Labour Organization.

### 4.3 DISSEMINATION

So far the dissemination of the technology developed at Habitech Park has been done through demonstrations and through the procurement of equipment and trainings for specific projects. Papers presented in journals and conferences have generated specific requests for the technology. Habitech Park recognizes that there is a need for systematic dissemination of the technology. The dissemination of the technology will be the priority of Habitech Park in the future.











MUD HOUSING - A SURVEY OF TRADITIONAL HOUSES IN SOUTHERN INDIA

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Asian Institute of Technology  
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ABSTRACT

Housing for the poor is one of the important issues for a developing country like India, which has majority of population living in substandard housing across the country side. Conventional building materials used in formal housing construction are becoming scarce, expensive and often beyond the means of peasants. People in the rural areas, therefore, depend more on locally available building materials. Mud is one such locally available material which is extensively used for house construction in India. Despite the fact that mud houses need heavy maintenance, people construct and live in mud houses because they are within their means. This paper examines the scientific and construction principles of traditional mud houses, with a view to find their applicability in solving the current mass housing problem of the poor. For this purpose a segment of Kallamadi village in Andhra Pradesh state, where people have used mud extensively for house construction was studied. It was found that mud houses here are not only economical but also easy to construct and suitable to the hot and dry climate of the region. There is a scope to rectify the drawbacks of this traditional mud construction system by adding new materials and technology to it.

Introduction

"Provision of shelter for all" is now widely considered a difficult task for most of the developing nations where majority of their population is found living in substandard or inadequate housing. Many reasons can be cited for this such as poverty, unemployment, under employment, inappropriate government policies, high costs of land and building materials, etc.. However a major stumbling block to the provision of shelter for many remains the high cost of building materials which alone accounts for 50 to 80 per cent of the total cost of a house depending upon the nature of the unit built..





As in every other aspect of our life in tropical developing countries, Western or high-technology based production processes are highly recommended and prevalent in building construction. Apart from the fact that these high-technology processes are neither suitable to our economies nor to our climate, they have limited the use of local building materials and technology.

As concluded by many housing experts (1&2), adopting indigenous construction systems may be the only possible means to get closer to the solution of mass housing problem in developing countries. Egyptian architect Hassan Fathy, in his attempt to improve the living conditions of the peasants in Egypt, reintroduced a traditional Egyptian construction system. He used sun dried mud bricks for the construction of walls, vaults, arches, domes and other components of the building. He built an entirely new village by using slightly modified traditional construction methods which were suitable to the affordability of the peasants. Fathy believed that this approach could raise the standard of living of world's poor people. He further mentioned "the solution to Egypt's housing problem lay in Egypt's history" (2). Taking the inspiration from Fathy's work the present paper focuses on the traditional mud housing existing in the hot and dry region of South India, with a view to first understand the basic principles upon which this construction system is based and then to find out their usefulness in solving the mass housing problem of the poor in the region.

#### Study Area

Kallamadi, a village in Andhra Pradesh state is a part of hot and dry region located in south India at a latitude of 15° north (Fig. 1). The mean monthly maximum temperature varies from 31.2° C in the month of January to 41° C in the month of May. The mean monthly minimum temperature varies from 18° C in the month of January to 28.4° C in the month of May. Wind blows from West and South-East directions for most of the period in a year. This region receives a mean annual rainfall of 524 mm and is considered as the driest or as least rainfall receiving region in South India.

Geographically the region is located in dry mid-lands up to which only a weak monsoon reaches. The monsoon which comes from South-West is obstructed by a range of hills along the western coast. As a result, it rains heavily in surrounding areas of hills and less in mid-lands.

#### Economic Base

The economic base of the region is mainly agriculture. Paddy, groundnut and cotton are the main commercial crops. Normally the farmers grow crops twice in an agricultural year. The main sources of water supply for farming are irrigation canals, tube wells and natural rain fall. Farming is done with the help of bullocks and bulk of human labor. Even then most of the agricultural labor remains idle for two or three months in a year during the summer. Sale of agricultural products is often done locally and at much lower prices than the existing prices in





urban markets. This is because most of the farmers are under pressure to sell their products immediately to repay high interest loans which they take from landlords to invest in agriculture, celebration of religious ceremonies, house construction, etc.. The income of peasant fluctuates from year to year depending on factors like the intensity of rainfall, crop conditions and market prices for their agricultural products.

### Social Life

Even though casteism, a social stratification in Hindu religion, has deeper roots in the country side, a high degree of social interaction can be observed among the members of different castes and religions in this peasant community. Their main source of entertainment is sitting on the platforms provided in front of the house and chatting with each other in small groups. Women are often seen engaged at farm or in domestic work but in leisure time they also prefer to chat with other women.

### Religious and Cultural Association with Mud

People in the study area believe that soil is a goddess that provides food and shelter to the people. Peasants get their food grains from the soil and also use soil as a building material. They use earthen pots and utensils for storage of food and cooking and consider it as a healthier practice. They also make statues of Hindu gods and goddesses out of soil for worshipping. They believe in the purity of soil and feel that every one of us have come from soil and will return back to soil one day.

### Layout and Built Form

With the influence of economy, climate, culture and available building materials, a kind of unique vernacular architecture has evolved in this region. Villages have grown in clusters of single storey buildings with narrow shaded streets leading to community open spaces. A typical village here appears as if it is a homogeneous mass of earth, from which each house has been carved out separately. None of these houses follow rigid geometry yet, they contribute collectively to an aesthetically pleasant setting which is quite in harmony with the nature. Suspense is created by gradually changing visual sequence as one walks along these ever shaded village streets (Fig. 2).

### Functional Indoor Spaces

A typical peasant's house as shown in Figure 3, is divided mainly into three spaces namely Gati Padu, Jagiti and Vantillu.

Gati Padu, which occupies almost half of the total plinth area is the place for livestock. Cattle is fed and given rest in this area after returning from work. The main asset of peasants is their cattle and that is one of the reasons for which





they keep their cattle within the visible vicinity for taking good care. Cow is considered as a goddess in Hindu religion and peasants here believe that it brings good luck to them if they look at cow's face first in the morning when they wake up. The cattle feed which is normally dry paddy grass and/or dry groundnut plants is stored on the mezzanine floor within the Gati Padu.

Jagiti is a living and sleeping place for household members during the hot day times. One corner of the Jagiti is normally used for storage of grains in bamboo woven silos.

Vantilly is mainly used for cooking and dining purposes. A wet corner is provided here for bathing and dish-washing. Both Vantilly and Jagiti are used as night time sleeping areas only during rainy season. Otherwise roof top is the main sleeping area during the night times.

### Building Construction

Even though the modern building materials like cement and steel are commonly used in semi-urban and urban areas of the region, the major construction activity here still follows traditional methods. Except in few places where stone is available abundantly, mud is the prime building material used for construction of dwellings in the country side of this region. House construction is normally done during the slack season for agriculture (February to April). Family members themselves participate actively in house construction with the help of one or two friends or hired labor.

#### A. Construction of Walls

Wall construction is done with crude sun-dried mud bricks. Bricks are cast with Banka mannu or clayey soil available at particular locations. Normally brick making is done off-site unless suitable soil is available at the site. If the soil has more or less clay content, sand or clay is added accordingly to form a proper mixture so as to prevent bricks from cracking. The raw mud is thoroughly crushed under the feet of cattle or men by adding water gradually to form a consistent paste. It is then laid on the ground in the form of a bund of one foot wide and ten feet long. The bund is allowed to weather for a day and then cut with a sickle into bricks of size approximately 15 cms x 15 cms x 30 cms (Fig. 4). Cut bricks are then dried under sun for a week by turning them regularly on all sides. When dry, they are transported to the construction site using bullock carts.

The walls are erected either on a stone foundation or directly on the ground depending upon the means of the individual. Bricks are set on the edges of wall and the space in between is filled with stone or brick pieces (Fig. 5). The masonry work is done in mud mortar with appropriate clay content in it. The wall is slightly tapered with 60 cms thickness at the bottom and 40 cms at the top. The four corners of the mud building are often built higher than the walls to keep the rain water off and prevent the corner from sinking.





Once the wall is erected, it is plastered with a mixture of mud and cow dung up to 2 cms thick. Soil which is used for plastering has a lesser clay content than the soil used for brick making. This plastering of mud walls needs to be done annually to protect them from rains. Maintenance of mud walls is a part of one of the important annual festival celebrations. During the festival they replaster the mud walls and paint them with white wash, red mud slurry and cow dung. This makes mud walls not only strong but also look aesthetically appealing.

### B. Construction of Roof

Building materials used in the construction of roof are palm or country wood and chowdu soil, a locally available soil which gets harden when it comes in contact with water. The roof is composed of a flat and thick layer of soil supported by wooden rafters and beams. The load of the roof is transmitted to the end mud walls and wooden posts/columns. First, the rafters are laid across the walls and/or beams and then covered with bamboo mats. Palm leave branches, country wood sticks and paddy grass are also used along with or in place of bamboo mats. A layer of chowdu soil is laid on top with a thickness ranging from 15 to 20 cms (Fig. 5). This top layer of soil needs to be replaced once in every 3 to 4 years, as it gets washed away by the rains. Another more permanent version of this roof is known as 'Madras terrace roof'. It involves dressed wooden rafters and beams of teak or other good quality wood covered with Cuddapah stone slabs set in lime mortar. The top and final layer here is also of chowdu soil.

### Scientific Principles of Mud Building

To maximize protection from the harsh climate of the region, the juxtaposition of buildings, built form and the choice of building materials in the study area have been done very carefully. Each house is set in East-West orientation with long walls facing either North or South. Grouping of houses is done very closely to each other in order to reduce the surface area of building exposed to the sun and also to keep the streets shaded throughout the day.

There is a considerable amount of difference in day and night temperatures of study area. The choice of building materials and built form here are in response to the prevailing hot climate. Walls are made out of thick layers of mud, to achieve structural stability and also to reduce the external heat transfer to indoors. As the roof receives maximum solar radiation during the day, the traditional roof here is insulated with a thick layer of mud and other organic materials so as to create sufficient time lag. In order to avoid the penetration of hot air in to the house during the day time there are no windows but small openings are provided in the walls near the ceiling to allow only hot air generated in indoors to escape. Due to heavy insulation, the heat absorbed by the exposed mud walls and roof during the day gets transferred to indoors after 8 to 10 hours, i.e., during the mid night. Simultaneously, the outdoor air temperature gets cooler during





the mid night and the cooled air starts flowing downwards due to increased density. This cool air enters indoors through the small opening or gavakshi provided in the roof and replaces the hot air inside (Fig. 6). The size of the opening in the roof is kept small enough so that the cooling effect of the air flow is larger than the heating effect of the sun. Cool air which flows in during the night gets trapped inside in the absence of windows and keeps the indoors comfortable throughout the day (3).

People in the region have adapted their living style in accordance with this climatic cycle. During the day time they stay indoors, which is comfortable and protect themselves from harsh sun. In the late evenings when it gets cooler outside, they move out and spend the nights in open yards or on roof tops enjoying the pleasant outdoor climate of the night. This cycle repeats throughout the year except for two months in winter when it is cooler during both day and night.

#### Limitations of Mud Building

The majority of the mud buildings in the study area have been existing for more than 50 years but their overall physical condition is not satisfactory. Despite annual maintenance, they present a serious threat of collapse during the rainy season. The limitations of mud walls and roofs in the study area are explained below.

##### A. Walls

1. It is a fact that mud is sensitive to dampness. In the study area most of the mud houses are built directly on the ground without any foundation or damp-proof course at the base. This lack in construction allows dampness to rise from the ground, penetrate the mud walls through capillary action and destabilise them.
2. None of the mud walls is protected from rains by means of either a horizontal projection from wall or a damp-proof plaster on the external surface of wall. The only protection to the walls is an annually replaced mud plaster. Any negligence on the part of the house owner in replacing this plaster every year leads to the structural collapse of the building.
3. Since there are no drainage facilities existing in the villages, all the waste water from each house is evacuated immediately outside at the base of the walls. This leads to the penetration of water at the base of the wall and ultimately to its collapse.

##### B. Roof

1. Mud roofs need a replacement of top chowdu soil once in every 2 to 3 years. This is often neglected by peasants because of financial constraints. As a result, once the top soil gets washed off, rain water





seeps through and rots the supporting woodwork.

2. Other sources of rain water leakage in the roof are the holes made by rats and ants. Since mud is very soft, they make holes in the mud roof and live in them. These holes become the major source of water leakage during the rainy season and because of which peasants sometimes forced to spend sleepless nights. Once the water leaks through the roof, it will start spoiling the roof and eventually the walls too. As a result these mud houses become hazardous to live during the rainy seasons.
3. Apart from the reasons stated above, mud roofs have become too expensive for the average villager. Earlier, the region was full with wood resources and people could afford to construct thick mud roofs using wood. Now that wood has become very scarce and expensive, this structural material is out of reach for most of them.

### Conclusions

The traditional houses existing in the study area are made out of mud which is the most flexible, climatically suitable and easily available building material in the region. The people living here over generations have developed an indigenous construction technology which if modified suitably can be adopted successfully to solve the mass housing problem of the poor in the study area and also in the other regions where similar climatic and socio-economic conditions exist. The defects of this system can be rectified with the help of new materials and technology rather than totally abandoning it. The strength and durability of the soil here can be improved by adding stabilizers such as lime and cement to it. Stabilized soil blocks can be used for the construction of foundation and provision of a layer of cement mortar at plinth level will act as a damp-proof course and stop the dampness rising from the ground. A replacement of wooden rafters and bamboo mat in the roof by precast R.C.C. members will not only make the roof stronger but also help avoid further deforestation. This renewal of traditional construction method would pass on our earthen architectural heritage to the future generations, for whom it may become the obvious choice for housing the masses.

### References

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2. Hassan Fathy, "Architecture for the poor, an experiment in rural Egypt", The University of Chicago Press, Chicago (1973).
3. Martin Evans, "Housing Climate and Comfort", The Architectural Press, London (1980).



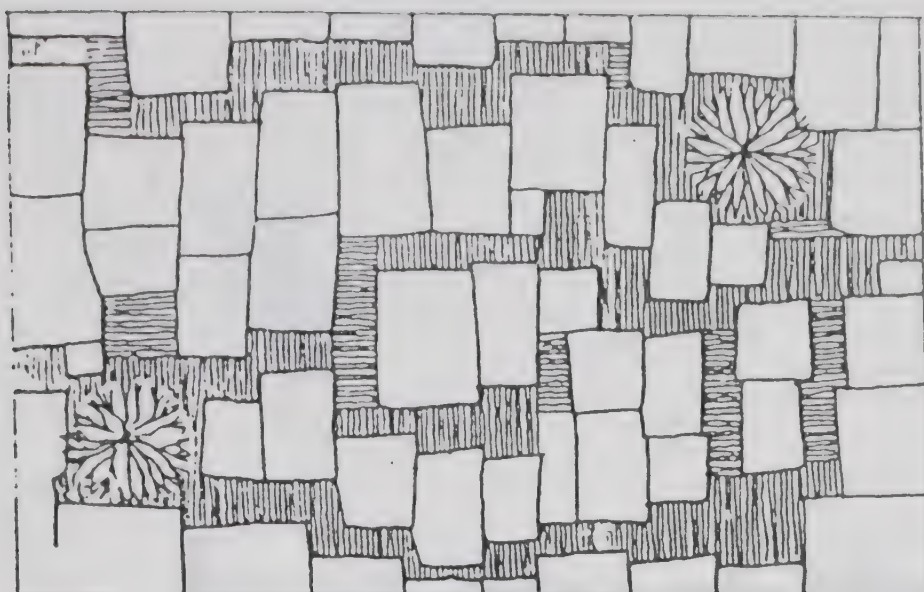




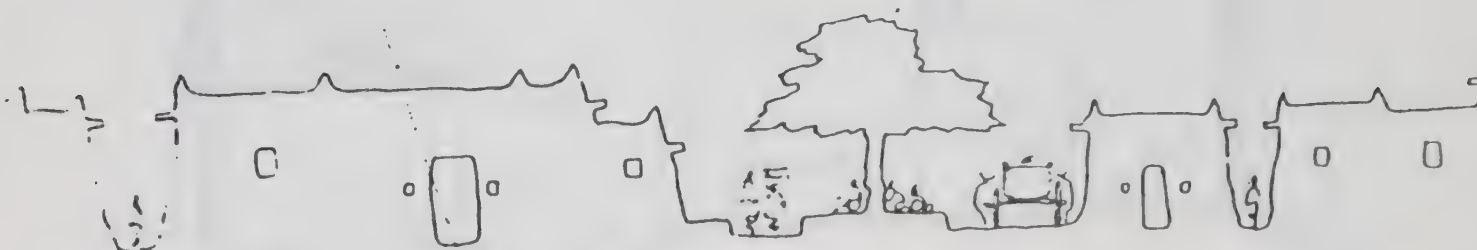
FIG.1  
LOCATION OF THE STUDY AREA







TYPICAL HOUSING LAYOUT



TYPICAL STREET VIEW

FIG.2  
LAYOUT AND BUILTFORM





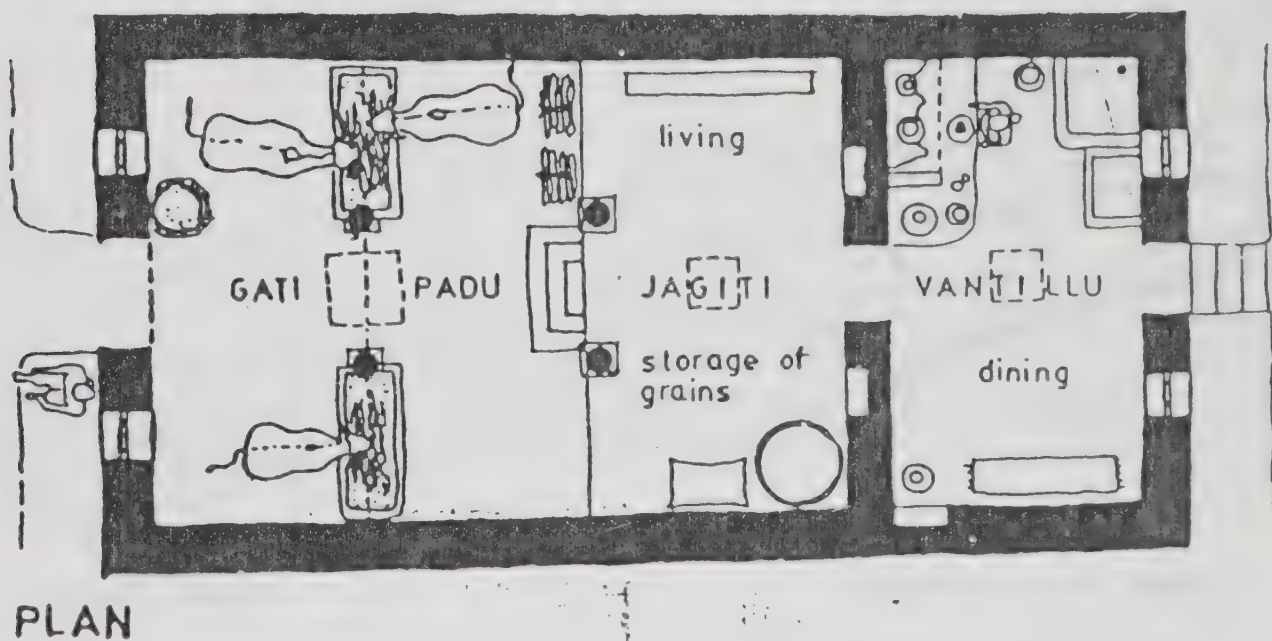
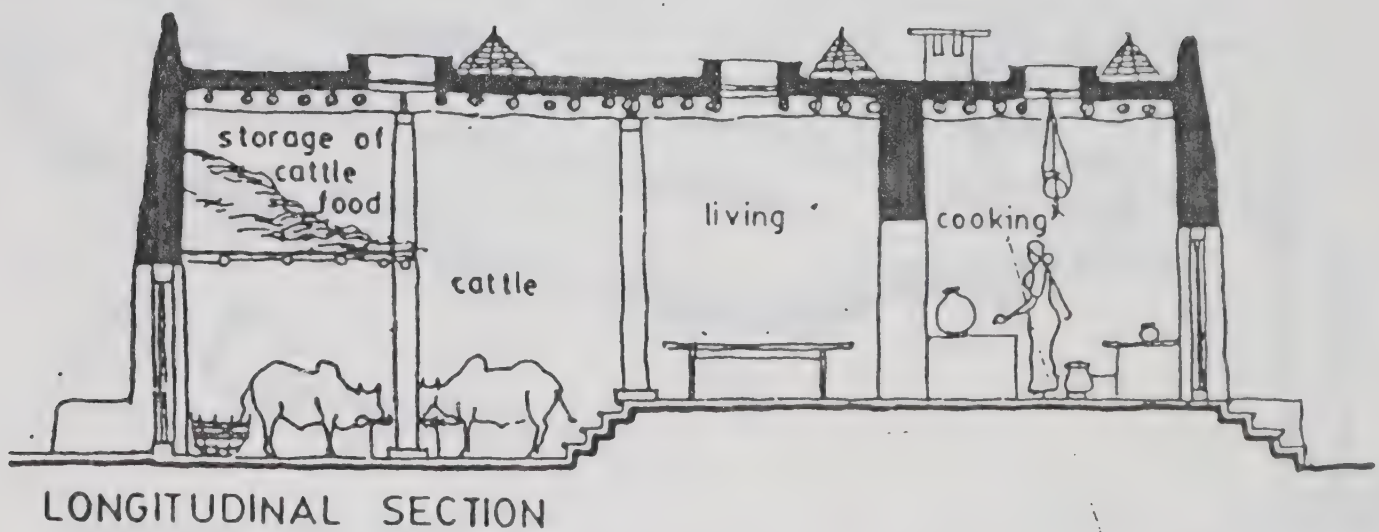
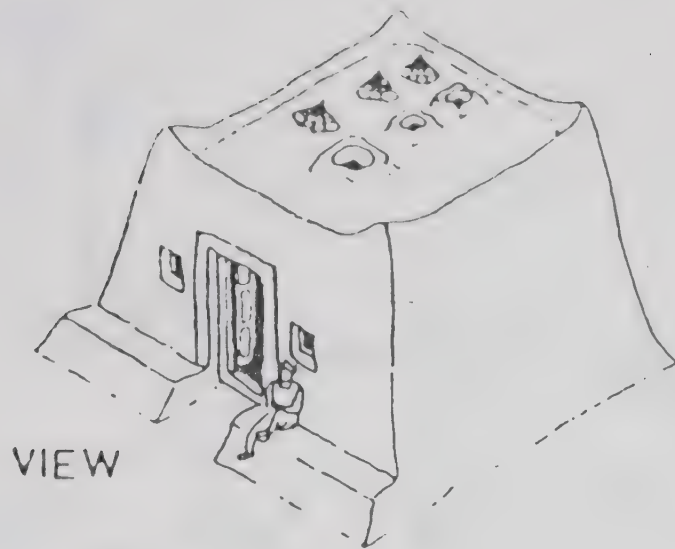


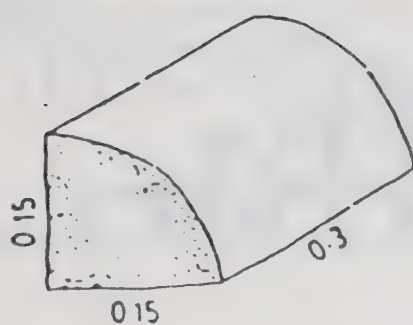
FIG 3  
TYPICAL MUD HOUSE



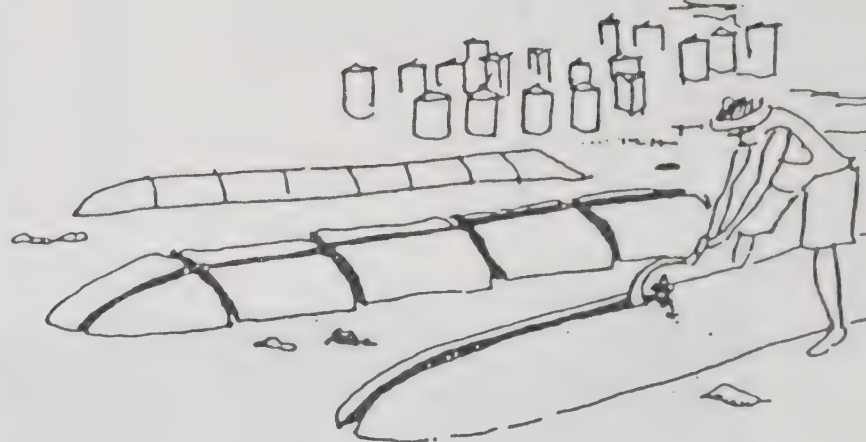




PREPARING THE MUD



TYPICAL BRICK



CUTTING THE BRICKS

FIG. 4  
MUD BRICK MAKING





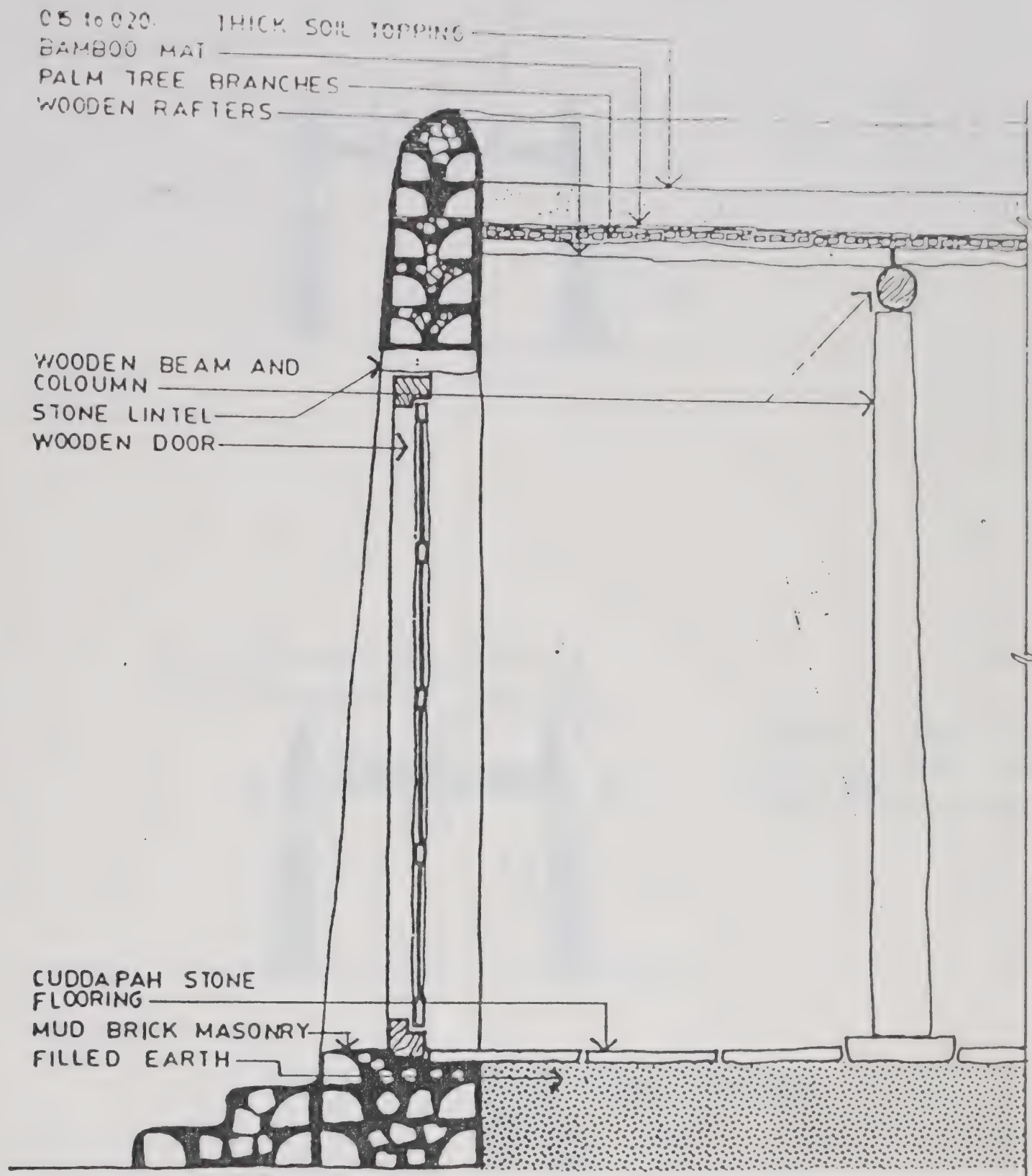
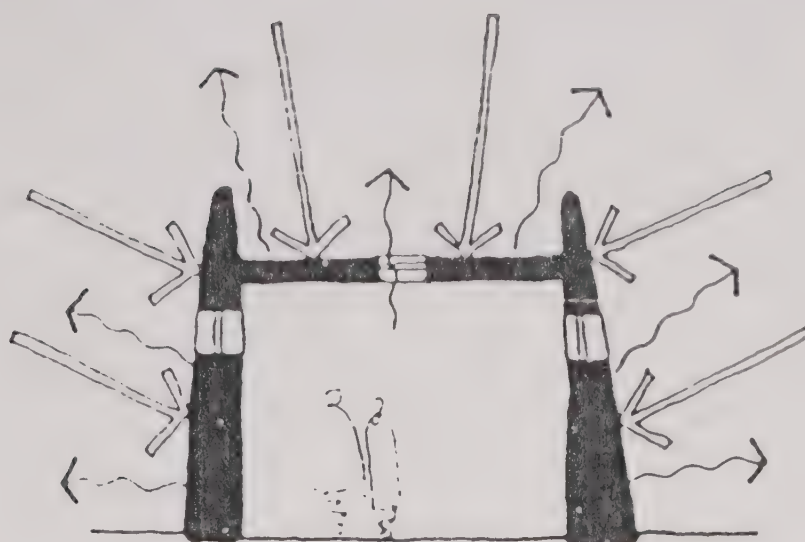


FIG. 5  
SECTIONAL DETAILS OF MUD HOUSE

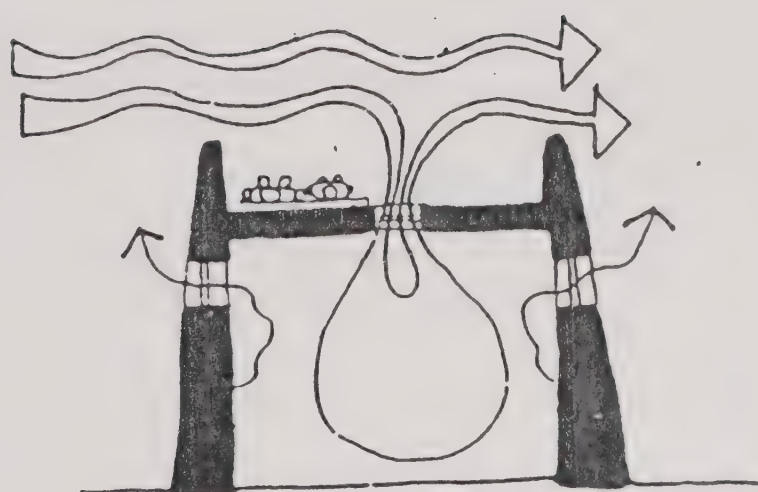






## DAY TIME

- HOT AIR RISES BY NATURAL CONVECTION.



## NIGHT TIME

- COOL AIR SINKS THROUGH SKY LIGHT DUE TO INCREASED DENSITY.



DIRECT SOLAR RADIATION

HOT AIR

COOL AIR

FIG. 6  
AIR EXCHANGE INSIDE MUD HOUSE



Faint, illegible text or a signature, possibly a name or a date, located below the second architectural drawing.









### ***Enclosure C***

- o Financial Outlay***
- o List of Members of the  
CHTRDA's Council***



**Financial Outlay**  
[1994]

[In Indian Rupees]

**A      Training**

Preparatory Training  
[one session of 3 days for  
40 participants @ Rs.100 per  
day per participant]  
(40 x 3 x 100)

..      12,000

**Step I [Phase I]**

Training in Production of  
Building Materials  
[30 participants for 15 days  
@ Rs.100 per day per participant]  
(30 x 15 x 100)

..      45,000

Raw Materials for Training

..      50,000

Resource Personnel

..      6,000

Training Materials

..      10,000

Travel Expenses

..      10,000

**Step II [Phase I]**

Training in Building  
Construction  
[30 participants for 20 days  
@ Rs.100 per day]  
(30 x 20 x 100)

..      60,000

Construction of Model Unit  
by the Trainees

..      100,000

Resource Personnel

..      6,000

Training Materials

..      10,000

Travel Expenses

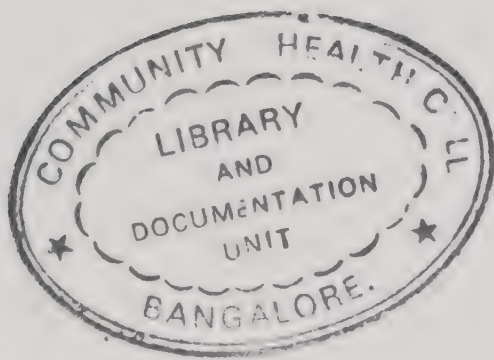
..      10,000





[In Indian Rupees]

<b>B</b>	<b>Infrastructure</b>		
	Land [Two acres @ Rs.500,000 per acre]	..	1,000,000
	Equipments [Four sets of SCHDS Machinery]	..	500,000
	Accessories	..	100,000
<b>C</b>	<b>Personnel</b>		
	Chief Trainer [Trained Architect] one person @ Rs.7,000.-- p.m. (7000 x 12)	..	84,000
	Training Associates [Two persons @ Rs.3,000.-- p.m.] (2 x 3,000 x 12)	..	72,000
	Planning and Workshop Associate [One person @ Rs.2,000.-- p.m.] (2,000 x 12)	..	24,000
<b>D</b>	<b>Administration</b>		
	Office Materials @ Rs.6,000 p.m. (6,000 x 12)	..	72,000
	Communications/Postage @ Rs.3,000 p.m. (3,000 x 12)	..	36,000
	Travel Expenses @ Rs.5,000 p.m. (5,000 x 12)	..	60,000
	Allowances to Office Associate @ Rs.2,500 p.m. (2,500 x 12)	..	30,000
<b>E</b>	<b>Miscellaneous @ 3% of the above i.e., Rs. 2,297,000</b>	..	68,000
			-----
	Total	..	2,365,000
			-----









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